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Zooarchaeological Interpretation of Two Sites in Southwestern Alberta

by

© Russell K. Brulotte

A THESIS

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The undersigned certify that they have read, and recommend to the Faculty of Graduate Studies and Research, for acceptance, a thesis entitled Zooarchaeological Interpretation of Two Sites in Southwestern Alberta submitted by Russell K. Brulotte in partial fulfilment of the requirements for the degree of Master of Arts in Anthropology.

ABSTRACT

Archaeological investigations at two sites in the Canadian Rocky Mountains of southwestern Alberta provided the data for analysis. The thesis describes various theoretical and methodological problems involved in habitat interpretation and reconstruction at these sites.

It is suggested by the small mammal data that application of macro-biological theories (Zonation Hypothesis) to interpret specific zooarchaeological sites can be erroneous. Diversity in habitats at particular sites can be explained better through mosaic hypotheses.

Taphonomic interpretations also indicated various causes of mixed assemblages in zooarchaeological sites. The natural interaction of each represented species in its particular and changing habitat must be addressed. In this respect MNIs are of limited use to archaeologists; the particular number of species present and their relationship indicates more closely the habitats in prehistoric times.

Analysed cultural data hint at a north – south rather than an east – west trans-mountain affiliation among prehistoric populations in the research area. Artifact functions and social activities at the sites are only inferred on a general scale; their relationships to the habitats in question are minimally known.

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I. INTRODUCTION

> The problem is that except for certain extraordinary sites, archaeological data don't come packaged as 'cognitive' or 'religious' or 'environmental' or 'economic'. They're all together in the ground – integrated in complex ways, perhaps, but integrated (Flannery 1982:276).

This thesis is aimed at presenting the specific problems of using modern analogy and a small mammal subfossil assemblage in attempts to reconstruct past environments and the human responses to the paleo-ecological situation. To accomplish this a specific geographic area, the Racehorse Creek drainage of southwestern Alberta, located in a specific climatic region (a foehn or 'chinook' zone) was investigated through field seasons 1981 and 1982.

Any area with a scarcity of fossil pollen locations, which would provide excellent paleo-environmental indicators, has forced researchers to utilize other kinds of data for their environmental reconstructions. Archaeologists have often used small mammal remains as a substitute where fossil pollen is lacking. The assumption is entrenched and continually regenerated among archaeologists that small mammals are good paleo-environmental indicators. The human responses to these interpreted environments and the ecology of the site area can be highly questionable when small mammal data are critically scrutinized.

The hypothesis is that small mammal remains may be used to reconstruct past environments if certain conditions are met during the analysis, including a thorough knowledge of the natural history of the mammals in question, combined with a cautious use of analogy. If these conditions are met then human responses may be tentatively inferred.

In the following chapters alternative and/or new hypotheses are generated Chapter I deals with the theoretical perspectives of the thesis, outlining two reference modes utilized by archaeologists today. Chapter II outlines the methodology incorporated in the field work and laboratory analysis. This chapter also describes the goals of the project, the natural environment of the study area today, ethnographic considerations, and the archaeological and zoological potentials which led the author to the decision to investigate the Racehorse Creek drainage. Chapter III includes the analysis of the cultural

remains recovered from remains at the Daisy Creek Site including artifacts, bone, and features. Interpretation of the materials is included within the chapter. Chapter IV is devoted to analysis of natural material and cultural remains excavated in the Racehorse Shelter Site. Chapter V contains criticisms of the main hypothesis. The critique outlines the various taphonomic interpretations of the Shelter deposits and questions the reasons for the accumulation of the deposit and species representation in the assemblage. Chapter VI is a summary with various suggestions on overcoming failures in interpreting man-environment relations in the past.

II. CHAPTER I : THEORETICAL PERSPECTIVE

The theoretical outlook of any serious researcher, whether personally acknowledged or not, will influence the research methodology and bias his interpretation of data. The theoretical perspectives generate the researcher's basic assumptions, which when translated into working hypotheses, guide him through his work and give meaning to his data. A thesis then must contain a guiding theoretical framework. The application of the theory becomes the thread which binds the various parts of the thesis together into a concrete whole.

The theoretical approach taken here involves aspects of what may be called environmental determinism. It assumes that the environment structures or shapes the various biotic communities by selecting appropriate species, determining their relationships to each other, and conditioning the individual members of each species and their responses within the functioning ecosystem. It is beyond the scope of this thesis to cover adequately all the factors which determine a species existence in a given environment. However, pertinent factors will be highlighted in the following discussion.

In an historical milieu, there are two distinct approaches for deciphering a faunal record in order to predict environmental factors. Both stem from biological formulations of the early twentieth century and are still found in a wide range of interdisciplinary literature today. Both models are fundamental to an understanding of zooarchaeological deposits and may structure our interpretation of them. The two approaches are the concept of the Biotic Province (or Zonal Hypothesis) and the Individualistic concept (or the Mosaic Hypothesis).

The Biotic Province Concept

It is necessary for zooarchaeologists to identify the particular part of the environment which the fossil or subfossil remains represent and determine how these remains contribute to the general interpretation of the paleo-environment. These parts of the environment are ecological or biogeographical units.

C.H. Merriam (1898) made the first attempts to classify North America by ecological units. Traveling by train through the Southwest United States, near Flagstaff, Arizona, Merriam noted the obvious altitudinal differences in environment as reflected in

vegetation zones. He classified the levels as the Sonoran Desert, Desert Grassland or Upper Sonoran, Conifer Montane, and Boreal Montane. He then mentally stacked the zones he saw one upon the other like a layered cake, and projected this vertical descriptive scheme into transcontinental belts which succeeded each other from north to south across North America. Unfortunately, Merriam excluded animals from this general floral classification. Yet Merriam, thereby, initiated the concept of life zones, which are the basis of much of biogeographical thought today.

Merriam's simplistic scheme had profound effects on later academic publications. Within two decades, his life zones had evolved into climax community concepts. F.E. Clements (1936:253) proposed that the term climax be used as a definable major unit of vegetation. Climax units formed the boundaries for the natural classification of plant communities. As we shall see later, these postulated community types are rarely measurable; and are definable only in the mental constructs of the researcher. However, prior to this concept, Clements had already theorized about biomes. Clements originally proposed that animals be included in the biome concept; therefore, it is misused when it is applied only to the definition of vegetation types (Whittaker 1975:185). According to Clements, animals played an interacting role with plants as members of biomes or climax communities. Conceptually, entire community units and biomes would migrate geographically together in the event of environmental change. Graham (1979:52) calls this assumption the Clisteral Shift Hypothesis. However, under stable circumstances, the biomes were seen as static provinces, connected but not intermeshed to any significant degree. When they migrated they moved as immutable community units.

The main approach to community units was formalized in the biotic province concepts of L.R. Dice (1943), who originally characterized each biotic province by peculiarities of vegetation types. Although Dice did much of his observation from the seat of a car, he managed to define the major biogeographical divisions of the continent, each characterized by the communities which composed them. Each living North American species could be attributed to one province or the other. Ideally, each was based on the total ecology of the area and "the distribution of all biotic elements within it (Axtell 1962:94)." The term ecosystem and the discipline of ecology evolved from the need to express the combination and interaction of the living and the non–living elements within a

biotic area (Orr 1976:270).

Biotic provinces can be likened to the scheme first proposed by Merriam. They include (after Orr 1976:258):

(1) the Arctic–Alpine Zone: above timberline and tundra regions,

(2) the Hudsonian Zone: northern coniferous forests,

(3) the Canadian Zone: the taller coniferous forests,

(4) the Transition Zone: a mixture of coniferous and deciduous species,

(5) the Upper Austral Zone: across the central U.S. from Atlantic to Pacific and south to Mexico,

(6) the Lower Austral Zone: more humid, extends across the the southern U.S., and

(7) the Tropical Zone: extends from Florida and Mexico to the northern part of South America. For the thesis only the Arctic–Alpine Zone, the Hudsonian Zone, the Canadian Zone, and the Transition Zone are pertinent for discussion and they will be referred to only in very general characterizations.

These zones can be further divided into a total of 27 subprovinces in North America alone. Although it is not necessary to list them here, these subdivisions can supposedly be used to define accurately and characterize the ecological associations within the provinces. Though seemingly a logical scheme, there have been no standards set for delineating the boundaries, the degree of overlap, and the distinct characterization of each province or subprovince. It appears that the biotic areas are arbitrarily demarcated, perhaps as a result of inadequate, sporadic, and less systematic fieldwork than the kind of research accomplished today.

Dice (1938) had various problems in applying his concepts. Of major concern was his inability to account for species which are wide ranging beyond arbitrary boundaries defined between provinces. His theory applied only to those species which inhabited the optimal zones. Though Dice was aware of the intermingling, notably of fauna, and even characterized some of the provinces by this fact, he could not account for intermingling in his static system. He made no attempt to consider the dynamic nature of communities. Nevertheless, the biotic province concept can be useful to a limited extent if it is used as a 'general' basis for classification.

More recently, some zoologists, such as P.S. Martin (1959), adapted Dice's system to classify terrestrial communities. Martin also considered these communities as stable units even when they were under the influence of great climatic change; they migrated or dispersed as complete units. He also seemed to overstress the co-existence of certain plants and animals in the biotic regions at a time when so little was known about the dynamic interactions of such communities. Twenty years ago there were too few Pleistocene-Holocene sites described in the literature and only sporadic data from modern ecological studies available for comparison. Martin's theoretical formulations seemed to fit the hazy picture of the Pleistocene, and there were no attempts to apply his concepts to the Holocene.

The zonal community concepts predicted for prehistoric archaeology are based upon the mistaken concepts postulated for the modern environment. Some modern studies still tend to support the Clisteral Shift Hypothesis of community unit movements and many paleo-zoogeographers record and present their data in such parallel analogous schemes (see, for example, Mehringer, King, and Lindsay 1970:181-182; and Hoffman and Jones 1970:360).

Hagmeier (1966) attempted to rework available biotic schemes into a numerical analysis of distributional patterns of North American mammals. He developed a complex system of faunal provinces. Though he did note that not all provinces were clearly discrete, he still attempted to classify biota into fixed units. Hagmeier broke slightly from the Merriam-Dice altitudinal and horizontal north-south scheme as he attempted to explain the diversity in fauna species in multi-directions. He based his classification on the high degree of correlation between the distribution of mammal areas and other kinds of natural areas. However, it was still basically a topographic classification of faunal provinces. It may fail in that it takes little account of micro-environments and the essential diversity in particular geographic areas such as the mountain regions north of 50 degrees latitude. There are few areas in North America where particular environments can be classified within rigid definable boundaries.

Faunal province concepts are subject to the same criticisms as the biotic province concepts from which they were initially formulated. Much zooarchaeological data notably lacks a controlled temporal framework. A fossil assemblage remains only a part of a

region and may represent only one animated drawing of the basic population unit, a one–frame representation of prehistoric time. Continual discoveries in vertebrate localities may assist in constructing usable mammalian sequences, yet these finds often tend to support and/or·modifiy those theoretical misgivings apparent in the literature today (e.g., Schultz and Martin 1970). Clearly, there are not enough of these localities available to support massive generalizations nor to create a complete picture of a particular past environment. The animated compositions of the faunal provinces are known to have changed temporally and spatially as they may be doing today. In order to view the changes that occur in a biotic region properly, one has to be aware of each frame in the animation so that the total animated picture will be as close as possible to reality. Objections to the rigid temporal boundaries set for biotic communities are many, and depend for the most part on the area of study. The differences in latitude, altitude, physiography, and meteorological condition from one area to another have not been well documented from the Pleistocene to the present. Uniform biotic schemes (such as Reeves 1973) must be used with extreme caution, else a distorted picture of the past will result. Zonal concepts have limited use for archaeologists.

The periods of evolutionary history of mammals change and are refined as their limiting inter–age hiatuses are reduced or eliminated (Repenning 1967:288). Such refinement is a continual process in the development of the entire biotic province concept. For instance, though we know that mammals, climate, altitude, etc., tend to shape the province, we should also realize that the province _per se_ has little to do with the total distribution pattern of, for example, small mammals. As an illustration, pikas recovered from zooarchaeological sites should indicate the existence of an Arctic–alpine province, however, pikas are also found in areas well into the coniferous forests as low in altitude as the supposed Transition Zone in the Rocky Mountains. As a result, incautious use of assumptions which may seem reasonable can result in interpretations of paleo–environmental conditions and changes that may be severely misleading or totally wrong.

The spatial distribution of species and the species composition in a biotic province may continually change, yet many species appear to reach a sort of stability in spatial distribution as well as morphological change. Species appearing to be stable are irrelevant

as time markers. For example, living small mammals have a long history of evolutionary development, but they have remained unchanged since at least the Late Pleistocene. Their use as stratigraphic time markers in the Holocene is unquestionably wrong The particular histories of many species, their points of origin and dispersal, have not been documented, although advances are being made (see, for example, Burns 1982). Therefore, there is much confusion when determining historical developments of species within particular biotic provinces in order to interpret the paleoenvironment of a fossil or subfossil deposit.

Further confusion can arise when applying diversity models to biotic or strict faunal provinces. As I have stated previously, diversity in the province often is accounted for by the researcher creating or interpreting subprovinces. These subdivisions may add nothing but abstractness to the theoretical biotic province concept. Habitats and niches are finer classifications (than subprovinces) of the place or position of a species in a community; and though these classifications could be characterized by some sort of temporal developmental framework and dimension within the theory of provinces, they are not. Habitats and niches remain abstract illusions and animations to interpretations of the present and the past. They do not necessarily reflect their larger provincial counterparts and they contain the same faults; namely, they lack a temporal and spatial framework in the face of diversity and change.

To summarize, the Biotic Province theory is a classificatory model designed to explain the diversity of North American biota by separating the common elements into definable units. It evolved from an altitudinal zonation scheme of horizontal belts or zones of biota, thought to lie in an east–west pattern parallel to the continental glaciers. In the event of climatic change, due to continental glacial expansion, the zones were postulated to have moved southward as immutable community units. The migration of entire communities and, therefore, of zones may be questioned. Another problem with the theory is the lack of acknowledgement of the effects of local climate, altitude, and other environmental factors. The Biotic Province theory interprets the world as a series of discrete ecological packages and avoids the notion of change in a spatial–temporal framework. It may be useful to zooarchaeologists only if they are aware of the limitations of the model.

The Individualistic Theory

When terms like variation, tapestry, spectrum, coincidence, gradual, and transition appeared with frequency in the literature, the Individualistic theory was proposed to account for the diversity, change, and chance in the biotic realm. This hypothesis assumes that because communities break up and intermingle quite freely at times, they may, in the event of climatic change, migrate interprovincially as individual species. As well, micro-environmenal changes would force spatial fluctuations within the province, ecosystem, habitat, or niche.

The first major proponent of this model was by the biologist H.A. Gleason. He stated (1926:26) that "every species of plant is a law unto itself, the distribution of which in space depends upon its individual peculiarities of migration and environmental requirements." By environmental requirements, he meant the individual's physical needs of adaptation. Gleason was condemned for attempting to destroy the rigid classification of Merriam and others of his time (e.g., McIntosh 1967:134). Supposedly, Gleason interjected too many intermediaries, introducing transitional categories between types, so that they would lose their definitive power. Nonetheless, his concept was basic to the comprehension of community structure and individual adaptation to specific and unique environments. He showed that there was both vertical differentiation on different levels of the community and horizontal differentiation expressed in the "patchy or mosaic-like occurrence of species (Whittaker 1975:104)." With temporal variation included in Gleason's concept, it remains viable and theoretically sound. Though first addressed to the plant community, this theory later became entrenched in most other environmental concepts.

In 1949, E. Deevey, in his Pleistocene Biogeography of North America, grasped Gleason's theory and projected it through time to explain the southward movement of 'life zones' during the last glaciation. He saw movement not as a unilinear arrangement but as a mixture of life zones, as a 'hodge-podge' of biotic regions. These types of structural compositions continued through the retreat of the glaciers and onward to the present situation. His theory was later strengthened by palynological reconstructions of vegetation sequences and their changes throughout North America (Charles Schweger per. comm.).

Ecological studies of present environments tended to support Gleason's and Deevey's theories. J.T. Curtis (1955:565), researching in Wisconsin, found no groups of vegetation species with similar behaviour. The distribution was spread out. He found that there was a vegetation series whose entire complement formed a series from those growing best in wettest sites to those growing best in the driest sites. Once the micro-environmental factors were taken into account, there were no discrete community units to refer to. The continuity aspect inherent in this theory can be challenged as being too linear in arrangement and too limited, because only vegetation is considered. Also it does not consider change as an important variable.

For a time, lack of stratigraphic control hindered the study of Pleistocene mammalian fauna in both a time continuum-gradient or a mosaic framework. The discovery of Rancho La Brea in Los Angeles helped to strengthen the Individualistic Hypothesis (Russell 1959:41). Nowhere else in North America was such a complete Late Pleistocene faunal assemblage represented. It was the type of site of which perhaps Gleason had dreamed of finding, a successional series. However, it did lack the finer stratigraphic control, which made it difficult to draw environmental generalizations about short intervals of time (Mehringer 1967:256). In any event, a faunal record was established from this site based directly on the similarities of species present. Small mammals rarely occur or were not found due to lack of fine screening techniques. Because they were not a major part of the assemblage they had no input into the development of the concept of succession and accumulated continuity, which was interpreted only from the larger mammal remains.

In earlier discoveries (Clements 1936:254), there were hints succession could be halted practically anytime and leave scant record of the arrest and the change. However, in succession, the communities go through a "...progressive development of parallel and interacting changes" (Whittaker 1975:184). As a result, these types of changes and communal developments through time may appear in a fossil deposit as a mixture of different biotic types or an integrative mosaic and be interpreted as such.

When small mammal deposits were uncovered at Owl Cave, Idaho, (Guilday 1969:47) there seemed to be many other constraints on successional faunal schemes. These constraints were highlighted by the known influence of such things as predation

pressure and hunting procedures upon small mammal communities, the rate of sedimentological deposition, and climatic changes of an irregular nature. Other interruptions to successional scenarios may be caused by discontinuities in topography, climate, and soil development. When using a theory of successional communities and/or of individual species progression, it is necessary to be aware of these discontinuities. They must be included in the interpretation of the fossil record and the taphonomic discussion.

Given a time perspective, all factors of the environment interact in an irregular and unpredictable manner. Thus there may be a variable number of unaccountable steps in an environmental gradient theory. There can be little realism attached to such studies as some propose (e.g., Kooman and Martin 1959:11). If the theory of environmental gradients are in doubt, then a shadow can also be cast on their corresponding community gradients or ecosystem gradients (ecoclines). The intermingling of different ecosytems must be characterized in a more predictable and regulated method.

Many other studies help to discredit the theory of gradient biotic zones and provinces. Fossil assemblages uncovered throughout North America in the last half of this century did not appear to be totally synchronous in represented species, and their dates of occurrence varied widely (Repenning 1967:288). This deficiency was especially true on a continental scale. A theory of island biogeography established by MacArthur and Wilson (1967:5), though based mainly on bird populations, showed an amazing species diversity between a continuous chain of islands. They attributed this diversity to climate and to equilibrium between rates of recurrent extinction and colonization. Later MacArthur (1972) realized other reasons for the distributions he saw. He then considered other factors such as habitat equilibrium, competition, and predation contributing to species distribution.

Discrete areas of refuge for species in the continuous belt of mountains running north–south across North America show similar ecological diversity at similar altitudes as did MacArthur's islands. However, there are changes when latitude is taken into account; the Southern Rocky Mountains being distinct from the Northern Rocky Mountains in altitudinal classifications. A state of nonequilibrium may be closer to the real situation in mountainous areas (Brown 1971) for island–like refugia may be formed by reduction in

preferred habitats (Kurten and Anderson 1980:41), and may wax and wane in size and number of species depending primarily on climate changes plus the re-establishment of habitats (Smith 1974:218, Burns 1980). Other factors contributing to this diversity may include a series of local extinctions (Smith 1974:1118), sterile areas between islands (Grayson 1977:510), and new species adaptations (Miller 1979:287). Genetic variations could also contribute to upset gradient-zonal theories.

Lastly, any single topographic area or 'biotic province' cannot account for all the factors with which a species can cope in a given area. There may be many deviations from the optimum situation. There is always room for change or for re-establishing particular lifeways in complex mosaic environments. Lundelius (1974:142) noted that environmental situations in the Late Pleistocene may have involved complex overlapping. However, modern analogues may not exist to help explain the diversity at that time period (Graham 1981:6). Yet there may be some areas in North America that may help to build substantive theories of individual and community development. Primarily due to the lack of qualitative fieldwork, one can barely visualize the combinations that occur at present. How then can we attempt to predict or interpret those combinations that occurred throughout the Late Pleistocene and Holocene when a multitude of species intermingled in a mosaic with a constantly changing environment? Though our environment today has the appearance of stability, it is probably not the case. In the short span of a researcher's lifetime, he may be able to document only the more discrete and subtle changes that occur during short time intervals.

The development of individual biotic species through time may be impossible to determine with a high degree of accuracy. There may have been intense compositions of faunal regions, exhibiting great frequencies of temporal and spatial change. Habitats may have fluctuated widely (Finley and Anderson 1956:80). The search for explanations and redevelopment of present theories is ongoing. We are only beginning to understand such things as population dynamics and the reasons why species co-exist. One of the most logical, though simplistic, theoretical explanations for the co-existence, overlap, discontinuity, and diversity of communities through time is that each species responded individually to change "based on its own tolerance limits" (Graham 1979:52). There is a great need to discover what the tolerance limits are for species so that predictions can be

reasonably made concerning the interpretive reconstruction of past habitats and environments based on a faunal assemblage.

In summary, the Individualistic theory, or Mosaic hypothesis, includes a more holistic approach to the study of present and fossil assemblages of biota, and to their human responses. It is at once vertical, horizontal, and temporal in its framework. It refutes the zonal or continual-gradient hypothesis because it readily accepts the realities of change, mixture, variation, differentiation, and overlap in the present as well as the past. One must consider each species in its own particular ecological existence, in its own right to variability, in order to view the fossil or subfossil assemblage with any measure of significant reality. The human cultural materials associated with the fossil mammal deposit can then be interpreted in a much better light, and the human activities in response to a particular environment more clearly delineated. The Mosaic Hypothesis will be the major theoretical framework for this thesis.

III. CHAPTER II: METHODOLOGY

The methodology incorporated in an archaeological research project will differ according to the determined goals and the specific project rationale of the archaeologist. The goals of this project were first, to discover an area with a relatively continual, yearly dry climate; second, to find zooarchaeological sites where bone preservation and archaeological materials would indicate some sort of temporal and spatial diversity; and third, to test excavate these locations for as long as good weather and monetary resources lasted.

To satisfy the above goals and to rationalize the project, a number of methodological hypotheses were generated prior to and while field research was conducted. The main reason for selecting the Racehorse Creek drainage (refer to map Figure 1). was because it was assumed that the southeastern slopes of the Rocky Mountains in this particular area contain a drier climate than other areas along the Canadian Front Range. Hypothetically, due to the ameliorated drier climate created by the continual high-frequency occurrence of the chinook in this area (see map of chinook frequencies, Figure 2), coupled with the natural adiabatic climatic influence of winds on the lee mountain slopes, the archaeological potential should be predictably high. The potential was expected to be high because it is assumed that people and the natural resources they exploit would "live at higher densities in richer and more productive habitats than they do in marginal and unproductive ones (Wynne-Edwards 1970:425)." As well, the drier, ameliorative micro-climate provided by the chinook zone should provide a suitable environment for the preservation of faunal remains which would otherwise not be recoverable in similar mountain regions.

Physiographic Description

A physiographic description is needed to clarify the aspect of diversity in the study area and to rationalize the zooarchaeological potential. The Racehorse Creek drainage belongs in the Livingstone-Porcupine ecological land classification system (Strong 1979). However, it is unique in its geology, topography, and micro-environments; and includes a fairly distinct climate and vegetation pattern. Local variations in the land classification system (cited above) should be expected considering the large scale, 1:100,000, chosen

FIGURE 1 -Map of the Racehorse Creek Drainage

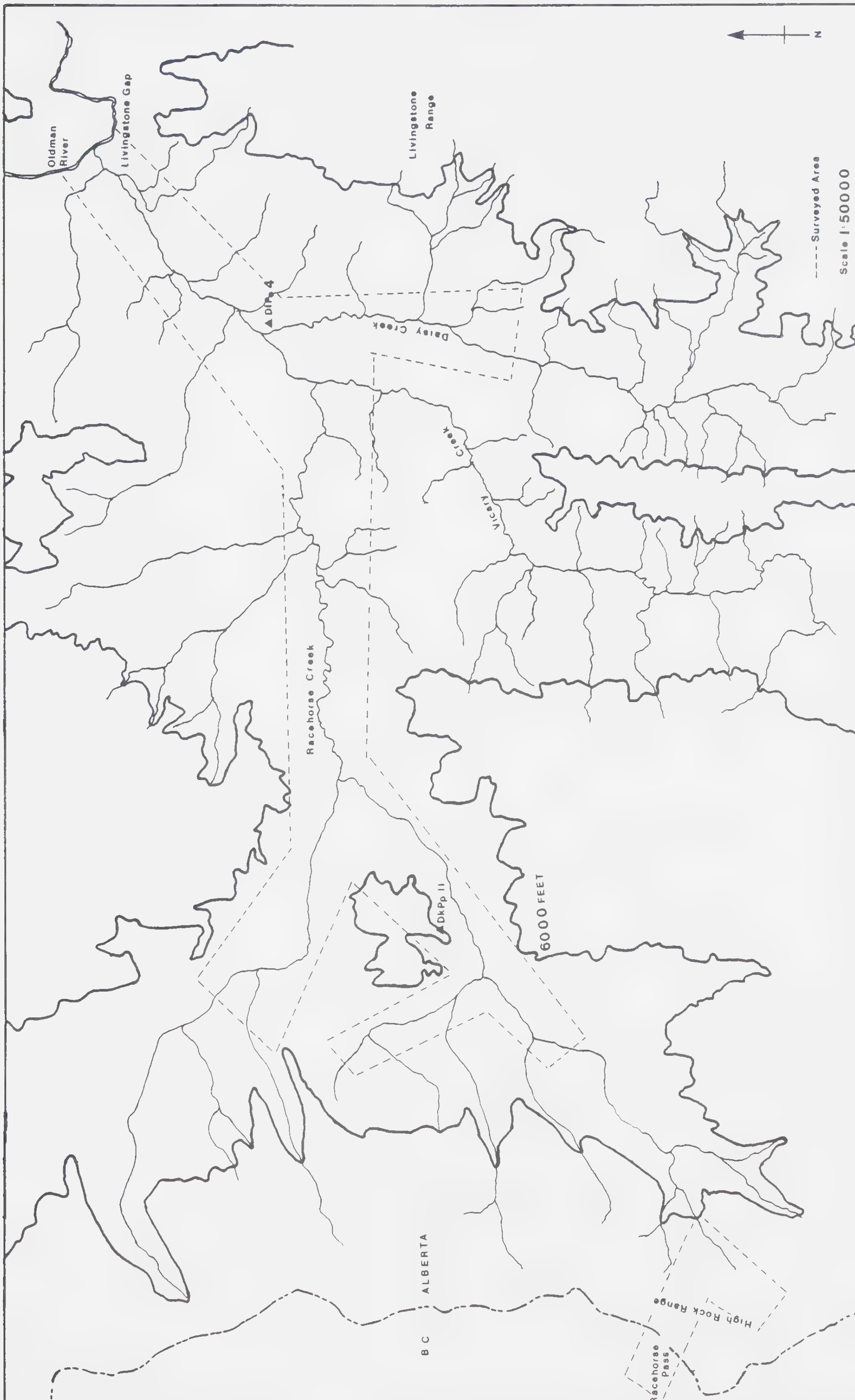
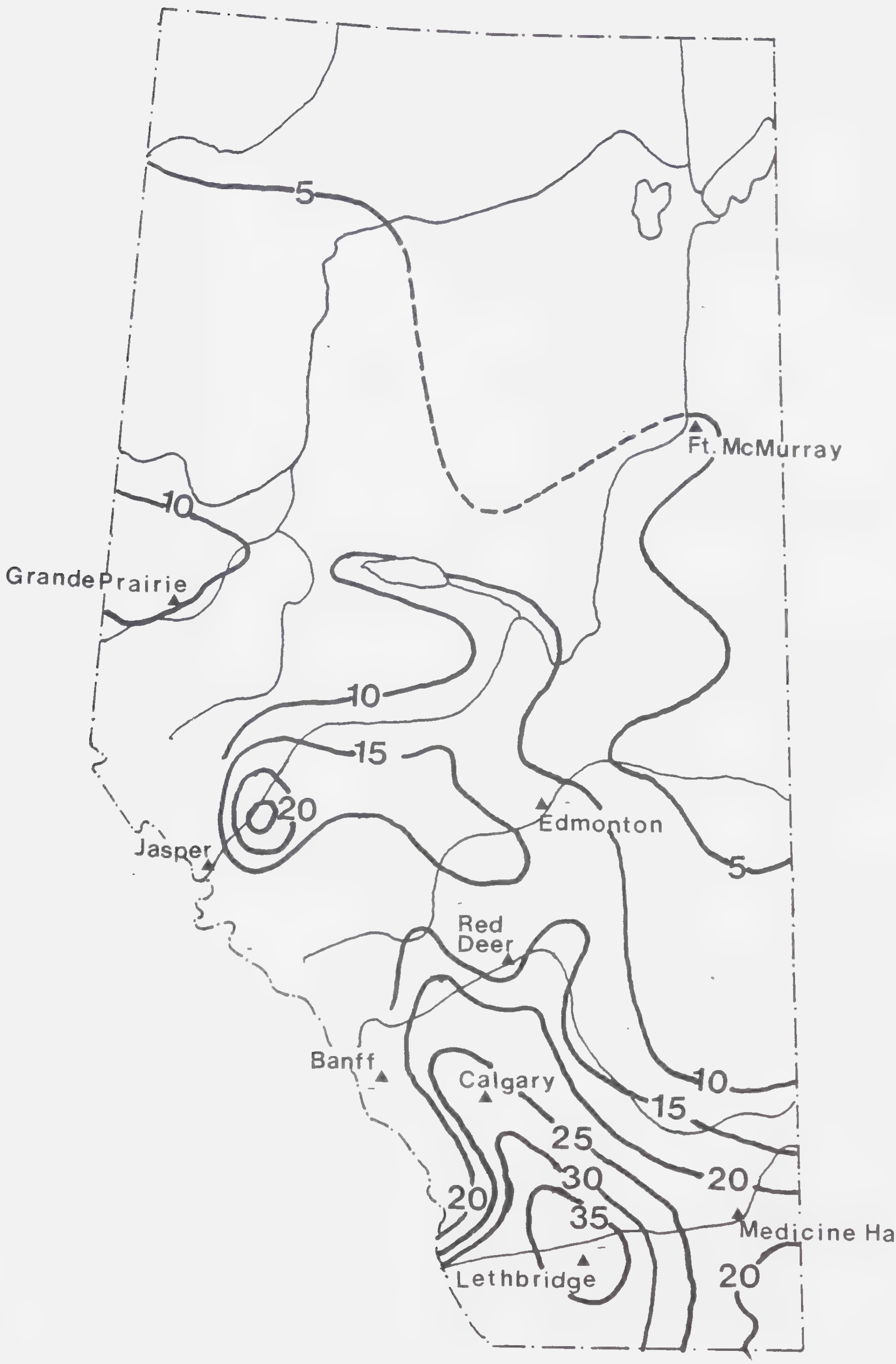


FIGURE 2 - Chinook Frequencies in Alberta
(after Longley 1967)



for the initial investigation. Micro-comparative data is nearly completely lacking.

The elevation of the drainage ranges from 4650 feet at the confluence of Racehorse Creek and the Oldman River to 6900 feet on the Continental Divide at Racehorse Pass. At the confluence of the north and south forks of the creek the water flows in a general northwest-southeast direction. The north fork flows directly from the west while the south fork flows from the southwest. The north sides of both forks and the main branch of the creek, are characterized by gentle hills with some cliff-faces, while the south side is known for its thick coniferous forested hills and peaks. The creek valley is only typically 'V' shaped in the near reach of the High Rock Range, and quickly broadens on approach to the foothills. The specific micro-environments vary altitudinally along the creek and are quite diversified.

The Alpine areas of the Racehorse Creek drainage are characterized by stable rocky meadows, particularly in the Racehorse Pass, and unstable scree slopes. Besides mosses and lichen etc. and the rare occurrence of a few krummholz of spruce and limber pine, there is a small array of common vegetation (see Appendix 1) and it is typical of the vegetation at elevations greater than 6500 feet in this area.

The Alpine 'grades' quickly into Subalpine at about 6500 feet along the upper creek forks. Here an interfingering pattern of small meadows occurs and vegetation density increases with sporadic conifers (larch, fir, spruce, and pine). The common vegetation includes Alpine types dominated by various types of scrub brush, depending on the topography and the occurrence of water sources.

In the lower reaches of the valley are major coniferous forests, basically stands of lodgepole pine and aspen groves, though all types of conifers occur throughout. Clearly, it is impossible to delineate the Canadian, Hudsonian, or the Transition Zones. There are some extemely marshy areas all along the lower valley floor. On the north side of the creek near the junction of the north and south forks, and along the north side of both forks, at elevations of between 5,500 and 6,500 feet, the aspen groves sometimes finger upslope into barren grasslands. The higher altitude grasses are mainly of <u>Festuca species</u>. The grasses in the pines and in the lower portions of the valley tended to be <u>Calamagrostis sp.</u> (Reedgrass). <u>Festuca sp.</u> (Festue) generally occurs at elevations greater than 100 metres above the creek in this mid-altitude location. The common vegetation at this

altitude is complex and integrative (see Appendix I).

The vegetation characteristic of the lower portion of the Racehorse Creek drainage to the confluence of the Oldman River is again integrative. Grassland hills dominate the north sides of the main creek branch, while the south sides are more open forested with lodgepole pine. Large open meadows dominate the valley floor, especially on recently formed wide creek terraces. Pine grass, grouseberry, and twinflower are the most frequently occurring species on the lower creek terraces. On the upper terraces arnica, pea vine, buffaloberry, alder, bearberry, bunchberry, wintergreen, and low bilberry are common components of the understory vegetation (Strong 1979).

The Archaeological Potential

By archaeological potential is meant that the project area should provide a considerable array and diversity of site types which would indicate that the area was utilized for multiple purposes for a long period of time. Such sites would include major campsites, hunting camps, lookouts, pictographs, lithic quarries, hunting and gathering resource processing stations, etc.. It was also assumed that the area would have been utilized for an extended period of time, probably for most of the Holocene. As there apppeared to be little climatic change since the advent of the last glaciation the climate of the area would have been viable as a resource unit to prehistoric groups of any time period. Previous archaeological surveys by Reeves, Getty, Bryan etc. (1965-1966) in portions of the area, produced a number of sites (refer to Table 1). The information was scanned at the Archaeological Survey of Alberta.

The majority of local sites were recorded on other drainages; those located on the Racehorse Creek were along the lower portions of the drainage. It also appeared, from a review of the information listed on the site forms, that none of the sites located in the area would provide the needed zooarchaeological materials to satisfy the goals listed in the section above. All of the sites appeared to be transitory campsites, or small hunting sites; and were mainly surface discoveries. Some of the sites in the area did indicate that the cultural manifestations in the area might be of considerable antiquity. However, dating a site from surface finds, of particular styles using projectile points and the like, is extremely insecure and any assumption concerning these is tenuous.

TABLE 1: Previous Sites Found Near the Racehorse Drainage

DlPo 8 - Middle to Late Prehistoric - in Livingstone Gap

DlPo 12 - Middle Prehistoric - on Station Creek

DlPo 13 - Early to Middle Prehistoric - on Dutch Creek

DlPo 14 - Early Prehistoric - on Dutch Creek

DlPo 15 - Middle Prehistoric - on Dutch Creek

DlPo 16 - Middle Prehistoric - on Dutch Creek

DlPo 17 - Middle to Late Prehistoric - on Racehorse Creek

DlPo 29 - Middle Prehistoric - on Racehorse Creek

Verne Denis, a local artifact collector, displayed an array of projectile point types including Pelican Lake, McKean, Hanna, Besant, recent arrow points, some lanceolate-like points, and a possible Scottsbluff. He retrieved these specimens in an area near the confluence of the Racehorse Creek and the Oldman River. Bryan (I983: per. comm.) recovered an Eden projectile point from the same location.

The only archaeological site in the immediate region that had been test excavated was the Gap Site, DlPo 20. The site is located in the Livingstone Gap; and when excavated in 1966, showed a series of 'living floors' above and below Mazama ash which dated at 6,000, 4,800, and 4,100 B.C. (Reeves 1971). The 'living floors' seemed to have been small bison bone deposits in conjunction with a few lithics. In 1982 it was noted that there were many areas in the Livingstone Gap where bison bone had accumulated. The Gap Site was not overly productive of faunal remains and should be excavated further to recover lithic and other cultural materials which could indicate the exact nature of the site. As it stands, the Gap Site can only be interpreted as a small isolated kill and/or hunting site.

Other archaeological work in the region has concentrated in the Crowsnest Pass. The Crowsnest Pass seemed always to have been a favourable area for semi-permanent human occupation due to its lower altitude and abundance of permanent water (Reeves 1971, Driver 1978, Drew 1980). In the Crowsnest Pass there are pertinent sites from Early Prehistoric to Historic times. It may not have been the only area in the region suitable for resource exploitation throughout the entire year. The Racehorse Creek drainage is only fifteen kilometres north of the Pass. Both areas are in the chinook zone and afford a variety of ecotones which support exploitable natural resources for a diversity of biota. They both could have been favourable areas for habitat resource utilization by prehistoric peoples.

Ethnographic Considerations

Ethnographic data tend to support the assumption that the area was not adverse to human occupation in the past. The diversity in natural resources could have been the main attractive force for occupation. However, the cultural historical background indicates that there are many conflicting opinions concerning the identification of the possible original inhabitants of the area. The utilization of diverse mountain areas by prehistoric or historic

groups in Alberta is not well known.

Some of the Kutenai Indians of the Tobacco Plains area of British Columbia believe that the entire Front Range from Banff to Idaho was their territory in Late Prehistoric and Historic times. There have been no archaeological investigations using a direct historical approach to confirm this widely accepted belief although it is certainly held in the literature (e.g., Reeves 1971, Turney-High 1941). The area was potentially utilized by the Kutenai only periodically for hunting and trading visits. MacLean (1896:137) mentions historic Kutenai in the Fort Macleod district trading and bartering; however, there is no documentation to indicate that the Kutenai proper resided on a more permanent basis in the foothills or mountain areas. They may have utilized part or all of the Front Range area as part of their seasonal round (Turney-High 1941). As different resources in variable habitats became available along the mountain slopes or altitudinally along a creek course, they were systematically exploited. Bison were hunted two times per year. The high altitude areas were utilized for the hunting of sheep, goat, elk, and possibly other animals. Some historic Kutenai remembered some of these high altitude inter-mountain hunting excursions. Women and children accompanied the hunters, and undoubtedly other activities besides hunting took place. A wide array of edible wild plants, small mammals, birds, and fish occur in most areas of the mountains and were probably exploited to some degree. Hides were probably initially prepared at these hunting camps. Whether the intermountain forays to exploit the micro-environments, and for hunting, were the result of, or made possible by, the use of the horse and whether they were conducted in prehorse days is not known.

A Plains Kutenai Band is supposed to have occupied the junction of the Bow and Oldman Rivers, and is reported to have used the Crowsnest and Waterton Lake areas as winter campsites (Chalfont 1974:19). Yerbury (1975) proposed that this group of Kutenai were more permanent residents of the Plains, camping mainly in the foothills from south of Fort Macleod to the Sweet Grass Hills. Supposedly, they summered farther into the mountains, camping at the junction of Michel Creek and Elk River in British Columbia. It is assumed they made summer excursions to utilize most of the Front Range-Foothills areas from the North Saskatchewan River to the Flathead area in Idaho. Turney-High (1941:19) refers to this group as a sub-band of the Tobacco Plains Band, but Schaeffer (1982)

distinctly calls them the Michel Prairie Band of the Plains Kutenai. Because of their amalgamation of Plateau and Plains culture and material traits they were possibly a border group living in, and more permanently exploiting, the Front Range and adjacent areas. These Kutenai were called the Tona'xa, and supposedly they migrated westward around 1780 (Yerbury 1975) because of forced warfare with the Peigans. Schaeffer (1982) documents an early smallpox epidemic in the late 1730s and hypothesizes that it was at this time that the Plains Kutenai were decimated, leaving their traditional area and migrating to, and amalgamating with, other inner mountain Kutenai and Flathead groups.

Driver (1978) suggests that the Kutenai were only recently adapted to this area; however, Wayne Choquette (1976: per. comm.) envisions a Kutenai Band of strictly mountain people living throughout the Elk River and Fording River drainages. These mountain people were supposedly living west of the Continental Divide, on a semi-permanent basis, from about 1,000 – 2,000 years ago to historic times. Choquette (1981) and Brian Reeves (1983: per. comm.) base this assumption on evidence concerning the temporal utilization of particular inner mountain lithic quarries. Determining cultural differences and change by this method is at best tenuous and may be unreliable, especially when analytic testing of all known quarry locations has not been accomplished. Many quarry locations have not been found or have been totally mined out. The mountain Kutenai forayed into the foothills on hunting excursions in a continuous manner throughout the year. However, there have been no sites excavated to test this theory. Archaeological manifestations indicate no real cultural breaks between either Plains or Kutenai–Plateau material culture.

The Zoological Potential

The zoological potential of the region was realized through personal observations in locations throughout the Rocky Mountains in field seasons 1975–1982. A diversity of wild animals occur in the area today. Many of these animals were observed on a daily basis throughout the 1981 and 1982 field seasons in the Racehorse Creek drainage. Live trapping conducted near DkPp 11 during the 1982 field season also provided information on the types of smaller mammals and birds occurring in the area today.

It is difficult to find deposits of preserved bones in the Canadian Rocky Mountains. In many investigated areas surveyed and tested on the British Columbia portion of the Continental Divide, it became evident that bone did not preserve well and/or that locations were unsuitable for bone accumulation. Examination of various rockshelters, cliff ledges, and small caves proved to be futile efforts. Brink's surveys (1972, 1974) on the Alberta side also turned up similar negative results. However, sites on the eastern slopes do exist, January Cave (Burns 1980, 1982) contained much small mammal remains, Eagle Cave (Burns 1975, Bryan 1982: per. comm.) which yielded faunal remains with cultural materials, Shaman Cave, and MacLeod Cave (Brink 1974) yielded some faunal remains which were not collected. Whitehorse Rockshelter (Hall 1976) with a cultural date of 3750 120 B.P., lacked faunal remains.

The Racehorse Creek drainage was given first opportunity for research because it is located in a chinook zone, in an area of high archaeological potential; and it had not been fully investigated before for zoological deposits. Higher altitude locations throughout the area offered a pristine potential. Another reason for selecting the Racehorse Creek drainage was because it affords direct easy passage through the mountains. Through such mountain passes as the Racehorse Pass, North Fork Pass, and especially the Tornado Pass, animals and man can easily exploit the resources of both the large coniferous forests of British Columbia as well as be within short distance of the foothill grasslands. The area was easily accessible by modern vehicle (4 x 4), and was open enough to be able to observe large portions of the valley system at one time. Walking was usually the easiest way to survey, and the grassland extensions hinted that the surface visual survey could be rapid. In some areas (e.g., Ewin Pass and Tornado Pass) the foothills grasslands protrude in a mosaic nature over the Continental Divide and provide an important ecotone area.

Many of the spur valley systems extending from the main mosaic area, such as the Racehorse Creek Drainage, contain a melange of various ecotones (see physiographic section). It was noted that a diverse fauna utilize the mosaic ecotones today; and it was assumed that, perhaps with little drastic climatic change since the last glaciation, the pattern of ecotones in the area had been established early. The hypothesized stability in local climates could have maintained a suitably diverse ecosystem to house a variety of fauna throughout the Holocene. The Racehorse Creek drainage, then, was a perfect

location to apply the methodology and test the main hypothesis of this thesis.

The 1981 - 1982 Survey

A short exploratory reconnaisance was the major project goal during the 1981 season. The parts of the Creek surveyed are noted on the map in Figure 1, which also includes the location of archaeological sites discovered in both seasons. A list of the located sites and their zooarchaeological potential are listed in Appendix 3. In 1981, 21 general areas along the upper Racehorse Creek were shovel tested and one specific site, DkPp 11, was test excavated.

DkPp 11, a small rockshelter, was the only site deemed suitable for further investigation. It seemed to be the kind of site we were searching for. The 50 x 50 cm test unit revealed the presence of a bone accumulation. A total of 1890 pieces were screened through a 2.5 mm mesh. Identified species included: (pika) Ochotona princeps, (columbian ground squirrel) Spermophilus columbianus, (bushy-tailed woodrat) Neotoma cinerea , (woodchuck) Marmota monax, (mule deer) Odocoileus hemionus, (snowshoe hare) Lepus americanus, (northern flying squirrel) Glaucomys sabrinus, (short-tailed weasel) Mustela erminea, and (water vole) Arvicola richardsoni. The majority of the bone was small mammal. A Pelican Lake-like projectile point (Plate 2, Fig. f) was recovered approximately 50 cm below surface. Burnt bone and charcoal confirmed the presence of prehistoric people who may have utilized the shelter as a small hunting camp and/or game lookout. The test was abandoned at 50 cm below surface because it was thought that further uncontrolled testing was unwarranted.

In 1982, 13 additional areas were included in the survey along the creek from the junction of the north and south forks to the confluence of the Racehorse Creek and the Oldman River. As in the 1981 survey, the crew was spaced at 10 metre intervals and dug shovel tests at 10 metre intervals where soil was developed. The number of selected tests varied, depending on the physiographic area being tested. When small terraces were tested, naturally fewer test holes were incorporated than on larger, flatter terraces, on prominent knolls, and at creek confluences. The depths of the random holes varied from 20 to 60 cm, and the depth generally reflected the depth of soil encountered. In most cases shovel tests were judgementally dug to glacial gravels, and their widths were

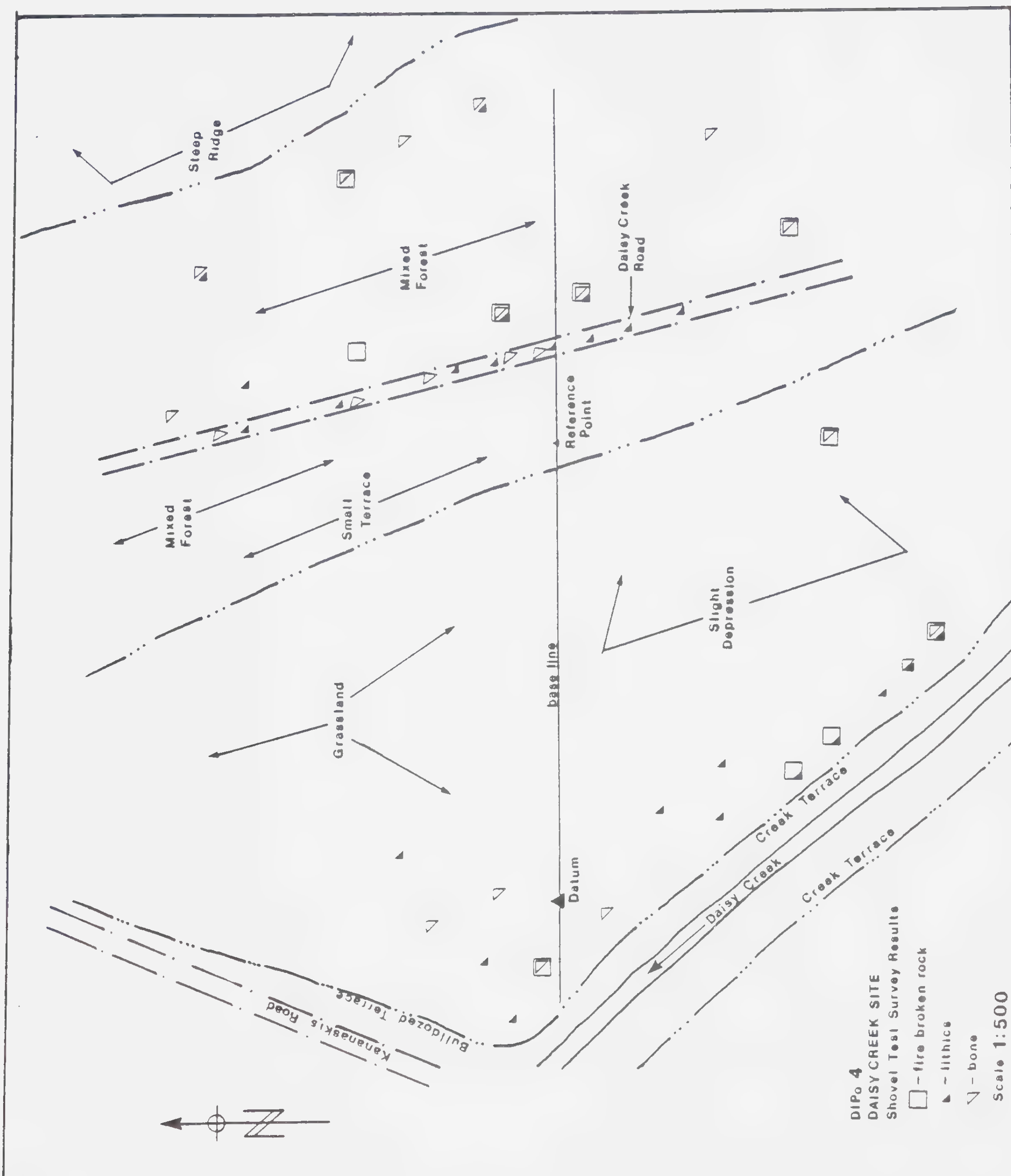
consistent with a shovel width of 25 to 35 cm. Large rock outcrops and large loose boulders were investigated for pictographs and for possible small shelters where bone accumulations and/or archaeological deposits might be preserved. Shovel tests were incorporated near and around these locales. Surficial features were also searched for, such as unnatural rock alignments and configurations, pits, hollows, and mounds. Entries of survey activities were made daily in individual journals by each crew member.

Once a definite archaeological site or bone deposit was encountered, the relative dimensions of the deposit, its depth and productivity, were determined by spacing shovel tests in judgemental areas at regular intervals near the site (usually at 10 metre intervals). Only at these sites were the shovel tests mapped and cultural contents consistently recorded. Mapping control and provenience was accomplished with compass, metre tapes, and topographic maps. The 1:50,000 topographic maps used were 82 G/15 Tornado Mountain and 82 G/16 Maycroft. Military grid coordinates were utilized for specfic location data on archaeological sites and for midpoints on negative data locations surveyed.

There were few archaeological sites with sufficient potential to warrant further test excavation. Of the available sites, 6 were small camps, 3 were probably hunting posts or lookouts, 1 was a pictograph site, 1 a possible quarry location, 2 isolated drop sites, 1 a rockshelter campsite, and 1 a major campsite area. There were 2 historic cabin sites recorded which were not pertinent to the thesis.

In the 1981 season it was decided that the Racehorse Creek Rockshelter, DkPp 11, was a viable site to test excavate. However, DlPo 4 also showed promise and it appeared to be the largest and most productive site to test excavate. The map on Figure 3 shows the reconstructed survey data for the Daisy Creek Site, DlPo 4. A decision was reached to test excavate here because the 144 test holes revealed numerous pieces of unidentifiable bone assumed to be bison, 75 pieces of lithic artifacts of 9 different types of raw materials, and various localized amounts of fire broken rock possibly indicating the presence of many subsurface hearths. The cultural refuse hinted that perhaps discrete activity areas existed, and the general scatter of cultural materials would probably cover more than 150 metres of creek terrace. The test holes indicated that the depths of the cultural materials ranged from 5 cm bs to 50 cm bs.

FIGURE 3 - Daisy Creek Testhole Data



The surface of DlPo 4 was broken by a dirt road along the east upper terrace of the site, providing an exposure of the archaeological deposit. Various large bone fragments, obsidian flakes, a Bitterroot projectile point (Plate 2, Fig. j) and a biface fragment (Plate 3, Fig. h), probably a large triangular projectile point midsection, also indicated that the site contained good potential.

As well, the Daisy Creek Site was located in a relatively central position in the Racehorse Creek drainage. From the site it was noted that direct access was available to various abundant natural resources. It was also in an extremely good location for access to surrounding areas such as Crowsnest Pass, Dutch Creek, Livingstone Gap, Porcupine foothills, and the High Rock Range. Thus, if a site existed in the Racehorse Creek drainage that contained materials reflecting the diversity of surrounding micro-environments, then the Daisy Creek Site should be a strong candidate. This incentive led to extensive test excavations.

IV. CHAPTER III: DIPo 4 - THE DAISY CREEK SITE

Methodology

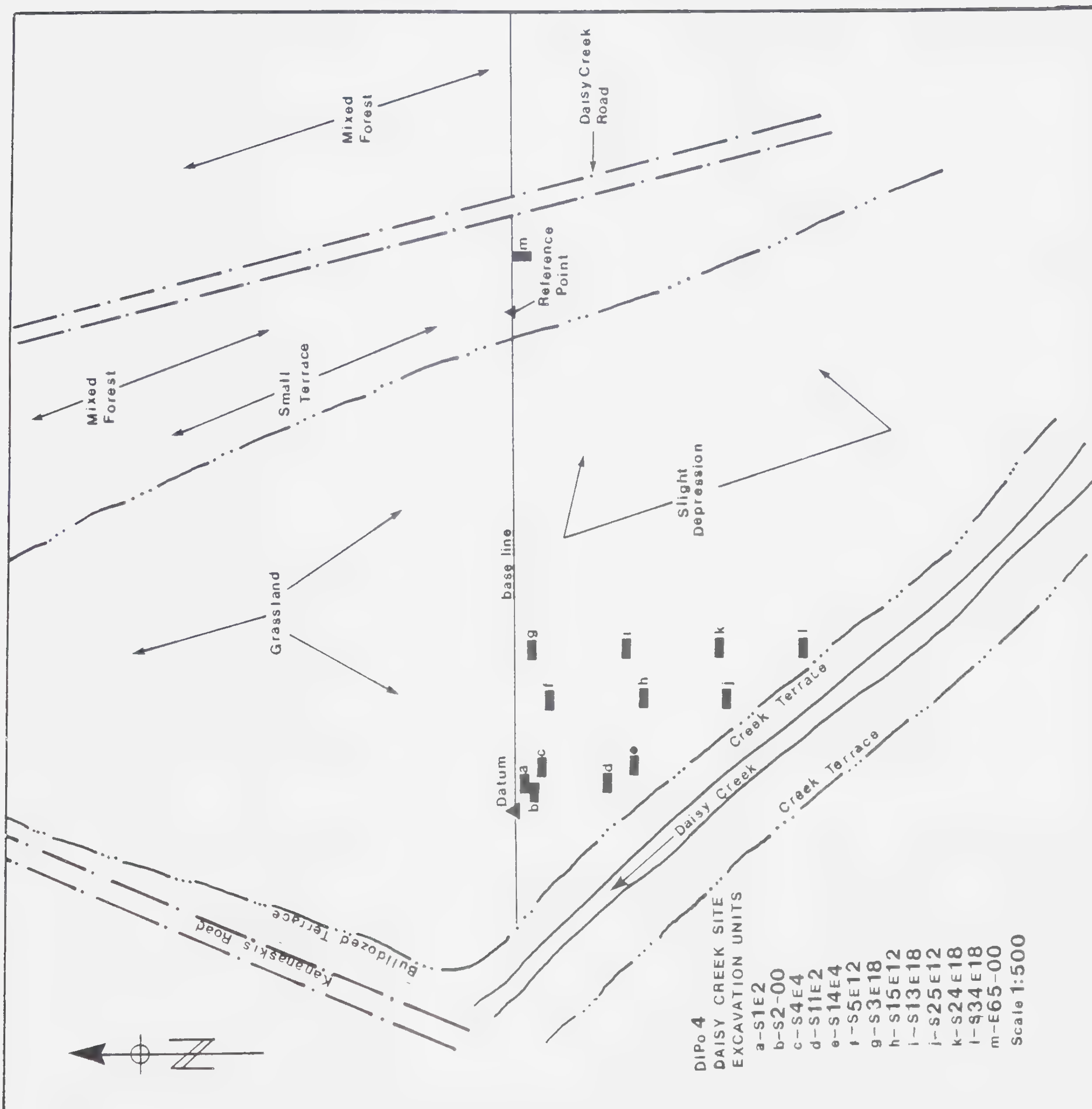
It had been previously scheduled that the Racehorse Rockshelter was to be tested in August 1982, considering its higher altitude and cooler climate. Therefore we had about three weeks to test excavate at Daisy Creek. A datum was established, and test units were randomly laid out across the site (see Figure 4).

A rod and transit was used to mark the depth from datum of the NW corner of each test unit. Thirteen 1 m x 2 m units were laid out. The units were troweled in 5 cm arbitrary levels until two consecutive sterile levels were encountered. Shovel shaving then proceeded until archaeological or zoological materials were again found; then troweling resumed. No visible natural stratigraphy was found, though vague soil changes were noted. The artifacts and of bone encountered while excavating were given a metric provenience in relation to the unit datum, using line levels and metric tapes. Each level was mapped and all artifactual materials and features were immediately plotted. All excavated matrix was hand screened through a 1/4 inch welded mesh. One complete unit (S34 E18) was washed and water screened through a 2 mm screen. This unit was selected because of the high frequency of small lithic debitage noted along the adjacent terrace edge. It was decided that due to time limitations it would not be productive to use this method for the entire site. See Tables 1 and 7 for the 2 mm screen results.

The cultural items found in the Daisy Creek Site and described in this chapter represent information concerning the responses of the prehistoric inhabitants of the Racehorse Creek drainage to the natural habitats of the area. The lithic artifact and bone analyses indicate a diversity which possibly shadows the variability in the natural habitats. The artifacts are diverse in lithic material type, in morphological shape, in overall size, and certainly in their function.

The analysis of the artifacts helped to generate the hypothesis that, because certain prehistoric groups exploit a variety of ecological areas for their subsistence, their material culture – their technological repertoire – would also be variable. It is assumed that the stochastic movements or responses of a group exploiting unpredictable and fluctuating environmental resources, in an area such as the Racehorse Creek drainage,

FIGURE 4 - Daisy Creek Site Test Units



would be subject to continual change; and would vary from season to season as well as from year to year. Thus the artifact inventory at a site should show particular variable traits reflecting the responses. The hypothesis does not assume that the habitat conditions technological styles in the manufacture of specific 'types' of tools for each and every habitat. However, a variety of tools should exist: diverse forms and many functional types.

Lithic Analysis

The 56 artifacts and 1500 pieces of debitage recovered have been individually examined. Complete and fragmentary artifacts, those showing a particular form or shape, use wear, or intentional retouch, were separated from the other lithic reduction flakes. The reduction flakes, or debitage, were separated further into a cursory classification based on gross intuitive description and lithic material types (see Tables 2, 3, and 4).

The artifacts were grouped into morphological types based on form and inferred function. The artifacts, such as projectile points, scrapers, etc. were measured, described, and classified by their general nature (Appendix 2). Artifacts with no general or standard form, such as the utilized flakes, were classified and described according to the metrical and functional characteristics of their utilized edges (Appendix 2). Metric measurements were taken with a metric caliper, and edge utilization was verified with an 80X binocular microscope. Edge descriptions were based on the formulations of White (1969).

The material types were confirmed by first hand observation of lithic quarries in the area, from previous visits to quarries outside the area, consultation with other archaeologists (e.g., Choquette and Reeves) and by a geologist (N. Cato, University of Alberta). The actual results are validated only for this study and should not be used for comparative purposes. There is always some disagreement among experts who use visual identifications of cherts and other micro – cryptocrystaline silicates (Luedtke 1979:745). However, handling of locally known material types and being familiar with the areal variations can be reliable in a specific study area (eg. Choquette 1981).

TABLE 2 - DlPo 4 - LITHIC DEBITAGE

LITHIC TYPE	THINNING FLAKE	FS	SHAPING FLAKES	FS	CORTEX FLAKES	FS	HEAT	TOTAL FLAKES	FS	% OF TOTAL
Quartzite			7		5			12		.9
Tourmaline	2		3	5				5	5	.7
Knife River Flint	9		9		2			20		1.5
Cherty Limestone	1		4		4		1	9		.7
Black Chert	3		17	2	4			24	2	1.9
Obsidian	16		51		3			70		5.1
Brown Chert	12		21	9	4			37	9	3.4
Avon Chert	9		42	43	4	1		55	44	7.2
Top of The World	1		28		7		2	36		2.6
White Chert	3		76	5	6			85	5	6.6
Etherington Chert	17		69	1	17	1		103	2	7.7
Gray Chert	15		103	35	13			131	35	12.9
Siltstone	19		70	25	12	2	1	101	27	9.4
Banff Chert	3		8					11		.8
Montana Chert	78	5	272	128	29	3	2	379	136	37.8
Kootenay Argillite					1			1		.1
Ochre								3		.2
Mica Flakes								2		.2
Sandstone								1		.1
Column Totals	188	5	780	253	111	7	6	1085	265	100
Grand Totals	193		1043		119		6	1361		
% of Total	14.2		76.63		8.74		.44			

TABLE 3 - DlPo 4 - FLAKE MEASUREMENTS (in cm)

LITHIC TYPE	MEAN L	SD n-1	MAX.	MIN.	MEAN W	SD n-1	MAX.	MIN.	MEAN Th	SD n-1	MAX.	MIN
Quartzite	1.96	1.1	3.8	.6	1.52	.54	2.4	.4	.52	.35	.9	.1
Tourmaline	1.39	.29	1.6	.9	1.17	.43	1.4	.8	.21	.04	.2	.2
Knife RiverFlint	1.06	.56	2.6	.4	.81	.35	2.0	.5	.16	.08	.4	.1
Cherty Limestone	1.88	.68	3.1	.9	1.63	.57	2.2	1.3	.52	.36	1.3	.3
Black Chert	.95	.44	2.2	.4	.89	.54	2.7	1.0	.22	.11	.6	.2
Obsidian	.87	.26	1.4	.4	.68	.23	.9	.3	.20	.30	.1	.04
Brown Chert	.97	.44	2.2	.4	.88	.39	2.1	.4	.18	.12	.6	.1
Avon Chert	.98	.37	2.2	.5	.88	.47	2.1	.3	.20	.14	.3	.1
Top of the World	1.04	.39	2.0	.4	1.00	.48	1.2	.4	.23	.15	.4	.1
White Chert	.68	.37	2.9	.4	.62	.31	1.5	.3	.16	.17	1.1	.1
Etherington	1.09	.55	2.8	.5	.92	.49	3.5	.5	.24	.23	.5	.1
Gray Chert	.83	.40	2.7	.4	.69	.34	1.8	.2	.18	.21	.8	.1
Siltstone	1.16	.71	4.3	.5	1.03	.61	3.8	.4	.22	.18	.7	.1
Banff Chert	1.45	.68	2.9	.7	1.42	.67	1.8	.9	.27	.16	.3	.1
Montana Chert	1.01	.48	3.9	.3	.87	.42	2.5	.2	.18	.15	.5	.02
Kutenai Argilite			.7				1.1				.2	
Ochre			1.0				1.0				1.0	
Mica			.9				.9				.03	
Sandstone			4.0				2.5				1.0	

TABLE 4 - DlPo 4 - UNIT FLAKE DISTRIBUTION

UNIT	THINNING FLAKES	SHAPING FLAKES	CORTEX FLAKES	HEATED FLAKES
S13 E18	55	198	10	2
S1 E2	1	16	4	
S11 E2	1	29	12	
S14 E4	16	29	9	
S3 E18	3	25	6	
S5 E12	41	77	13	
S25 E12	11	91	18	
E65 00	4	21	4	1
S2 00	8	91	5	
S4 E4	10	25	3	
S15 E12	8	21	7	1
S34 E18	18	99	8	2
S24 E18	8	59	10	
Totals	188	790	111	6

All measurements taken on tools and their individual descriptions are presented in Appendix 2 and are not repeated in the following section. Individual flake measurements and descriptions are not given below nor in an appendix. Only their mean measurements and general classifications of material type and morphology are presented. Other metric information is available upon request.

Material Types

The Daisy Creek Site proved to be rich in different types of lithic raw materials. Approximately 19 distinct types of materials have been identified and three other types have been noted in or near the Racehorse Creek drainage (mudstone at DkPq 21 Plate 7 Figure i, crystalline quartz and andesite at DkPp II Plates 3 and 4 Figures d and e respectively.)

At Daisy Creek there are of cherts (10 types), quartzite, obsidian, siltstones, igneous basalt, argillite, mica, ochre, shale, and sandstone. Many of the sources of these materials are known; and others have not been discovered or are of an ubiquitous nature (e.g., mudstone, quartzite etc.) in the region. The list below gives a account of the material types and their known sources.

Quartzite – local

Basalt – Unknown (British Columbia)

Flint – Knife River, Dakota

Cherty Limestone – High Rock Range

Black Chert – Waterton or Top of the World

Obsidian – Kepler Quarry, Yellowstone Park, Montana

Brown Chert – Unknown

Avon Chert – Avon Quarry, Montana

Top of the World Chert – Top of the World Park, British Columbia

White Chert – Etherington/Livingstone Quarries, Alberta

Etherington Chert – Etherington Quarry, Frank, Alberta

Gray Chert – Local High Rock Range

Siltstone – Local streambeds

Banff Chert – Banff, Alberta

Montana Chert – Devil's Eyebrow Quarry, Flint Creek, Montana

Kutenai Argillite – Kootenay Lake, British Columbia

Ochre – Unknown

Mica – Elk River Valley, British Columbia (?)

Sandstone – local

Crystaline Quartz – Quartz Lake, Rocky Mountain Trench (?)

Andesite – Crowsnest Volcanics

For information on the specifics of the above material types, especially the geological information, refer to Bussey 1977, Choquette l981, and Pike 1973). Other descriptions can be found in any basic geological dictionary.

The obsidian was analysed by Dr. Lee Sappington, University of Idaho, Moscow. Materials came from three different archaeological sites in the drainage, including Daisy Creek The 26 pieces over 2 cm in size submitted for trace analysis were compared to 16 known sources from British Columbia, Washington, Idaho, and Montana. All pieces showed a 99% correlation to one specific quarry in Yellowstone National Park. The implications of this correlation will be discussed in the interpretive section of the concluding chapter.

Debitage

A total of 1361 pieces of debitage were classified into 4 categories: thinning flakes, shaping flakes, flakes with cortex, and flakes showing evidence of heat treatment (see Tables 1, 2, and 3).

Thinning flakes comprised a moderate percentage of the total lithic assemblage. A thinning flake was classified as such if the length of the flake was greater than its width, and the flake had a generally uniform thickness of under 0.2 cm. A thinning flake indicates the single manufacturing activity of reducing a lithic edge for a desired thickness or sharpness. Thinning flakes usually showed special platform preparation (Crabtree 1972).

Cortex flakes are those flakes with original cortex material adhering to them. They comprise a small percentage of the total number of flakes. The cortex flakes indicate some on site reduction was taking place. The majority of flakes with cortex are of local cherts and Montana chert. This majority of cortex on these materials can be expected due

to the relatively high occurrence of them in the artifact inventory.

Shaping flakes include all forms of irregular reduction flakes, retouch flakes, shatter, etc.. They indicate that a variety of tools were manufactured and/or refashioned at the site. The artifact inventory (see the descriptions in Appendix 2) lacks tools made from Brown Chert, Cherty Limestone, Gray Chert, Basalt, White Chert, and Kutenai Argillite, though some of these materials are well represented in the flake inventory.

Only 6 flakes were noted to have been heat treated; the lithic material was discoloured and some pot lidding was evident. Yet perhaps these were the results of accidental contact with fire from hearths or forest fires. The low quantity does not suggest that heat treatment of lithic materials was common nor necessary in the manufacture of tools.

The fine screened material comes from one unit and is vastly under-represented in Table 1. Most of these flakes were retouch and shatter flakes. The fine screen test showed us that a great quantity of debitage under 2mm was lost, and no new material types were discovered in this small sample.

Utilized Flakes

The 41 utilized/retouched flakes comprise 2.9% of the total lithic assemblage and 5.0% of the formed artifacts. Because of the limited time factor allowed for analysis, all flakes were rapidly examined and those not showing immediate (under an 80X scope) definite heavy use damage and/or retouch were eliminated from further analysis.

All of the utilized/retouched flakes were from percussion flakes, and were manufactured from a variety of material types. No preference for a particular material type or flake form was noted. Basic analysis divided the flakes into several descriptive categories. These categories included: steep or shallow angle edges; light or heavy step fracturing; bifacial or unifacial retouch; method of utilization; wavy, straight, concave, or convex edges; and the number of edges utilized and/or retouched. The degree of angle of the edges were determined with a goniometer and means ascertained from three to five different measurements along the edge. This analysis (not presented in Tables here) showed that there was little consistency in the form of the flake edge, the degree of angle, nor from the other edge descriptions. All types of edge forms clustered between 25 to 45 degrees in angle, and clearly are not segregated enough to determine any

functional correlations. Perhaps this is the result of a small sample size. Edges utilized numbered one to four, with a high degree of double edged flakes utilized.

It is interesting to note that there is a diversity in utilized/ retouched forms and that the larger number of these flakes may indicate that many activities not requiring formal tool types or particular styled edges were taking place at Daisy Creek. Many of the flakes were snapped after utilization and then discarded. Others, intact, show deliberately utilized curved edges (see Plate 6 Figure c), perhaps for use as shavers on bone or wood. Others (Plates 5 and 6) would function quite well in many diverse scraping and cutting tasks requiring only a sharp edge. Many of these could be referred to as 'expediency tools;' however, caution must be used with such kinds of classificatory definitions because of the inherent biases involved in such terminology (Frison 1982).

Many of the utilized/retouched flakes were large enough that they could have been made into specific tool types. The fact that they were not suggests a somewhat casual or variable use of lithic materials for arbitrary application to diverse activities. A flake can do a variety of tasks and function well as a multi-purpose tool. Flakes would require little retouch to keep them operational for time limited tasks, and they can be expected to be casually discarded. For example, the large flakes (Plate 4 Figure i and k) probably functioned well as knives and/or scrapers until they were discarded.

Formed Tools

Tools classified in this category are those that feature a particular form which indicates that they were manufactured for a specific function. Identification of these types of formal tools was determined through familiarity with stone assemblages in British Columbia Plateau and Rocky Mountain areas. Particular styles and their sub-categories were determined by comparison with assemblages from the Crowsnest area, and their relative ages informally described by Reeves 1983. In the thesis, styles are not considered a definitive indication that particular cultural groups inhabited the Racehorse Creek drainage exploiting distinct natural resources. Typologies in a stylistic sense tend to regulate in a most unrealistic way the archaeological interpretations of the actions and natural motivations of a prehistoric hunting and gathering people. Authors using stylistic

classifications are often in error, confusing cultures with technologies (Bryan, per. comm.). These classifications do not allow for variability or persistence over space and time, nor do they indicate particular cultural patterns or population movements. In this study it was more profitable, considering the sample size and stratigraphic homogeneity at Daisy Creek, to use typology in general descriptive terms and to interpret the artifact assemblage in terms of the response of any group to the local diverse and changing environment.

Projectile Points

Of the artifacts, 23 were classed as projectile points of variable styles which include (after Reeves 1983, Choquette 1973):

Small side notched and unnotched triangular arrow points

Plate 1 Figures a,d,e,f,g,h,i,j,

Late Late Prehistoric ca. AD 800 – 1750.

Plate 1 Figures n,o,p,

Early Late Prehistoric ca. AD 400 – 800.

Side notched and corner notched dart points

Plate 2 Figures a,b,f,

Late Middle Prehistoric ca. 2000 BC – AD 400.

Plate 2 Figures g,i,j,q,

Early Middle Prehistoric ca. 5500 BC – 2000 BC.

The range of styles, their random horizontal and vertical distributions (Tables 3 to 7), and the diverse material types indicate a number of different interpretational possiblities. These include: (1) that the people in the drainage were involved in a complex interaction of technological traditions through time; (2) that there was technological retardation through time; (3) that they were scavanging different styled points from different areas; (4) that many different cultural groups inhabited the valley, attracted by the availabiltiy of a variety of natural resources; or, finally, (5) that permanent mountain inhabitants were like a 'sponge,' integrating at any time (depending on the manufacturing capabilities of the individual stone knapper and the availability of natural lithic resources and their preference through time), technological innovations producing particular formal

TABLE 5 - LEVEL DISTRIBUTION OF LITHICS
DlPo 4 - UNIT S13 E18

ARTIFACT TYPE	LEVEL 1	2	3	4	5	6	7	8	9	10	TYPE TOTAL
Quartzite				4							4
Tourmaline											0
Knife River Flint		1	3				1				5
Cherty Limestone						1					1
Black Chert						1		1			2
Obsidian	1	1	3	4	3	12	8		1	2	35
Brown Chert				2	1	1	6		1		11
Avon Chert				1							1
Top of the World Chert			3								3
White Chert				1							1
Etherington Chert		5	16	12	14	8	3		1		59
Gray Chert	1	10	21	1							33
Siltstone	2	2	2		4	5	1		1		17
Banff Chert		1	3								4
Montana Chert		14	21	22	13	12	2				84
Kootenay Argillite											0
Ochre											0
Mica						2					2
Sandstone											0
Arrow Points							1				1
Dart Points			1			1					2
Scrapers											0
Bifaces					1						1
Drills/Borers											0
Knives											0
Gravers											0
Utilized Flakes			2	1	1	1			1		6
Cores											0
Pecked Stone											0
Carved Stone											0

Total Flakes = 262
Total Artifacts = 10

TABLE 6 - LEVEL DISTRIBUTION OF LITHICS
DlPo 4 - UNIT S5 E12
(note: flakes are described as lithic types)

ARTIFACT TYPE	LEVEL 1	2	3	4	5	6	7	8	9	TYPE TOTAL
Quartzite										0
Tourmaline Chert										0
Knife River Flint		1		1						2
Cherty Limestone										0
Black Chert	1			1						2
Obsidian				1			1			2
Brown Chert		4	1			2				6
Avon Chert			2	3						5
Top of the World Chert			1	1						2
White Chert	4	1	1							6
Etherington Chert		1		1						2
Gray Chert		1								1
Siltstone		1				1				2
Banff Chert		2	1		1					4
Montana Chert	6	37	18	12	12	9	2	3	1	100
Kootenay Argillite										0
Ochre										0
Mica										0
Sandstone										0
Arrow Points										0
Dart Points		1		1						2
Scrapers										0
Bifaces									1	1
Drills/Borers				1					1	2
Knives										0
Gravers										0
Utilized Flakes				2	1	1			1	5
Cores										0
Pecked Stone										0
Carved Stone										0

Total Flakes = 135
Total Artifacts = 10

TABLE 7 - LEVEL DISTRIBUTION OF LITHICS
DlPo 4 - UNIT S15 E12
(note: flakes are described as lithic types)

ARTIFACT TYPE	LEVEL 1	2	3	4	5	6	7	8	TYPE TOTAL
Quartzite									0
Tourmaline Chert				1					1
Knife River Flint			1						1
Cherty Limestone									0
Black Chert			1						1
Obsidian						2			2
Brown Chert					1				1
Avon Chert			1	1					2
Top of the World Chert									0
White Chert			2						2
Etherington Chert				2	1			1	4
Gray Chert		1	1						2
Siltstone		1	1	2		1	1		6
Banff Chert				1					1
Montana Chert		3	2	5	1				11
Kootenay Argillite									0
Ochre									0
Mica									0
Sandstone									0
Arrow Points									0
Dart Points		1							1
Scrapers									0
Bifaces									0
Drills/Borers				1					1
Knives									0
Gravers					1				1
Utilized Flakes			1						1
Cores									0
Pecked Stone									0
Carved Stone									0

Total Flakes = 34
Total Artifacts = 4

TABLE 8 - DISTRIBUTION OF LITHICS - DlPo 4 - UNIT COUNTS
(note: flakes are described as lithic types)

ARTIFACT TYPE	UNIT										*
	S1 E2	S11 E2	S14 E4	S3 E18	S25 E12	E65 00	S2 00	S4 E4	S34 E18	S24 E18	Fine Mesh
Quartzite	2	2			1	2			1		
Tourmaline									2	2	5
Knife River Flint					6	2		1		2	
Cherty Limestone	1	1	1		2			1		2	
Black Chert		3	2	4				2	6	2	2
Obsidian		3	3		12		3			9	
Brown Chert	1		2	4	4		4	2		1	9
Avon Chert		4	3	3	4	5	7	8	9	4	44
Top of the World Chert	2	8		3	3	1	10	2		2	
White Chert	5	2	2	1	15	2	34	3	8	2	5
Etherington Chert	1	1	12	2	11	2	3	1	1	2	2
Gray Chert		3	3	5	37	2	13	1	19	9	35
Siltstone	3	8	10	2	9	1	25	4	5	9	27
Banff Chert				1		1					
Montana Chert	3	7	6	9	17	11	7	13	69	26	136
Kootenay Argillite				1							
Ochre		2	1								
Mica											
Sandstone	1										
Total Flakes/Unit	19	44	45	60	121	29	106	38	120	72	265
Arrow Points		3	3	1	1		1	2		2	
Dart Points						1					
Scrapers						1					
Bifaces											
Drills/Borers			1								
Knives					2	1					
Gravers				1							
Utilized Flakes		2	4	2	6	2			3	4	
Cores							2				
Pecked Stone		1									
Carved Stone							1				
Total Artifacts/Unit	0	6	8	4	9	5	4	2	4	6	0

* = Fine Mesh is 2mm Screened Flakes from Unit S34E18

styles of projectiles for the hunting of specific types of animals.

Though neck widths are important indicators of cultural continuity and change in certain areas (Corliss 1972), it was felt that the number of stemmed points was not a large enough sample to conduct such a test. As well, the diversity of styles would render such a test useless; many of the projectiles are mid-sections or fragments or without necks (see Plates 1 and 2). There are no dates available from the site for time reference and correlation.

Other Formed Tools

Three definite scrapers were recovered; two are expended tips and one is complete (Plate 3, Figures a,b,c) All are ovate end scrapers; and are different in size, working edges, and material types. Utilized flakes may have been more functionally important than formal types for scraping and preparing hides and other scraping activities at the site.

Only one biface fragment was recovered (Plate 3, Figure f), and it is distinct from others recovered in the Racehorse drainage (Plate 3 Figures g, h, i, j). All the bifaces found in the drainage were diverse in form and material type.

Four drills/borers (Plate 4 Figures c, f, g, h) were all made from flakes, and do not exhibit standard forms or material types. Others from the drainage (Plate 4, Figures b and e) are as variable. They indicate that a variety of size perforations were made in hide, bone, antler, and wood.

Knives were classified as such on the basis of a steep edge, heavy retouch and usewear, and basic functional shape. There were three examples represented (Plate 4, Figures j, k, l, and possibly Plate 3, Figure e). Again the material types and flake forms are diverse.

Only one graver was noted (Plate 4, Figure d). It is made from a flake of unidentifiable material.

The cores recovered also exhibit the tendency of the assemblage to be diverse. All are flake cores (except perhaps the possible micro-flake-blade core fragment Plate 7, Figure a, with a well prepared canted platform). The cores fall into two basic categories:

(1) Lens Cores; these cores are expended blocks of chert from natural lenses. All of these appear to be of local chert (Plate 7, Figures c and e).

(2) Cobble Cores; these are unifacially worked split cobbles with flakes removed from one surface only; and thus a large portion of the platform is cortex (Plate 7, Figures b and h).

Because cobble sizes and lens thicknesses, as well as the amount of reduction, varies considerably, it is expected that cores and their fragments would vary widely. Flake production was the purpose of their formation; however, Plate 7, Figure a may be an anomaly, hinting at a possible variation in core types. The majority of the cores are similar to others found in the Racehorse Creek drainage (Plate 7 Figure c, d, f, g, i).

A pecked grooved maul fragment of quartzite (Plate 8) was an important find. Its entire form cannot be determined. It was firestained and had been reused as a hearth rock. It may be indicative of the processing of vegetable matter or of pemmican making.

A carved piece of shale, presumed to be a pendant (Plate 4, Figure m), is the only one known of its kind from the area. Both the maul and the pendant indicate that other lithic technologies besides flaking were known and utilized by the prehistoric inhabitants of the drainage. Because these two articles are made from locally available materials, it is doubtful that trade is responsible for their occurrence at the site.

Ochre occured in small quantities, and may or may not reflect its use as a social exhibitionary material such as for body painting or artifact decoration. The pictograph site (DlPo 63) near Daisy Creek may have been the only recipient of this ochre, though the pictograph site cannot be directly correlated with Daisy Creek; test holes were unproductive at this site.

Two small pieces of mica were also found and their use at Daisy Creek cannot be ascertained. As well, one piece of exotic sandstone appears not to have been utilized. It may have meant to function as an abrader. One other sandstone artifact, a unifacial chopper (Plate 9, Figure b), was recovered at a lower altitude in the drainage.

Soils

The soils at Daisy Creek were moderately well drained Orthic Eutric Brunisols. Solum developement extends to approximately 20 cm with the Bm composing 80% of the profile (Stong 1979). The Ah, an organically enriched mineral horizon overlies the Bm which shows evidence of color modification and/or slight clay accumulation. The Bm horizon may show evidence of podzolization. The Bm horizon has a pH ranging from 5.5 to 6.0. Although the remainder may constitute an Ae it is a weakly developed horizon. Litter layers are usually in excess of 5 cm. (see profiles Figure 5)

Till forms the dominant surficial deposit. It ranges from loam to fine loam in texture with cobble content varying from very to exceedingly abundant. These are mainly moraine deposits.

Features

There were no structural remains such as postholes or tipi rings noted anywhere in the excavation. This lack of structural remains may have been caused by their 'non-visibility' when excavating with only 1 x 2 m units. The archaeological features besides lithic flake clusters were hearths and a possible boiling pit.
One unit, S34 E18, showed definite clusters of retouch and/or shaping flakes of particular materials, especially Montana chert. In other test units, there were some indications that there may have been small clusters of flakes of particular types of material; however, due to the small sample size and the disturbed nature of some units (reworked sediments), it could not be determined whether the occurrence of these type of features were common for the site as a whole.

A large number of hearths can be inferred at the site due to the scattered nature of the fire broken rock. However, in Units E65 00, S4 E4, and S14 E4 definite fire broken rock clusters indicate hearths, with charcoal, burnt bone, and burnt fragments of wood (refer to the Figure 6). Only in Units S4 E4 and E65 00 were tools found in association with the hearths. In Unit E65 00 an ovate scraper (Plate 3, Figure a) and a projectile point fragment (Plate 2, Figure a) were recovered in this context, and in Unit S4 E4 a projectile point was found in good association with the hearth area (Plate 2 Figure i). No other areas displayed such associations and the tools found were not significantly localized to suggest

FIGURE 5 - Daisy Creek Site Unit Profiles

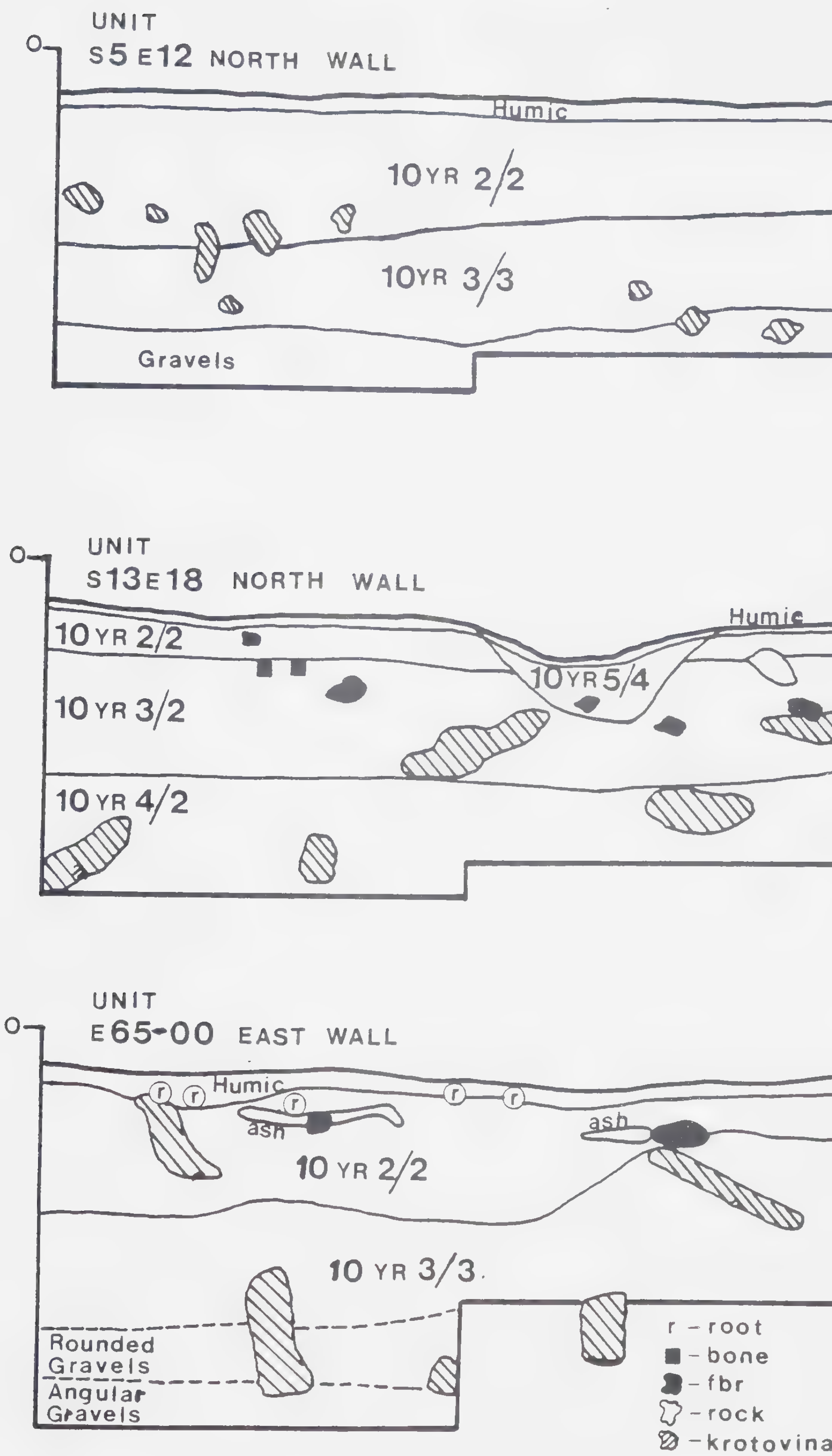
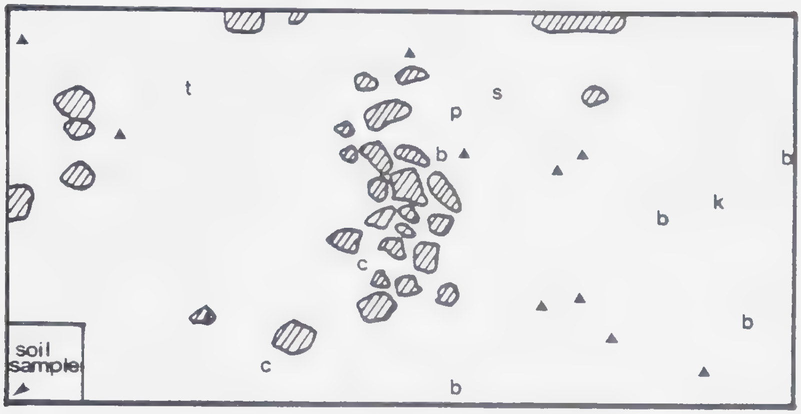


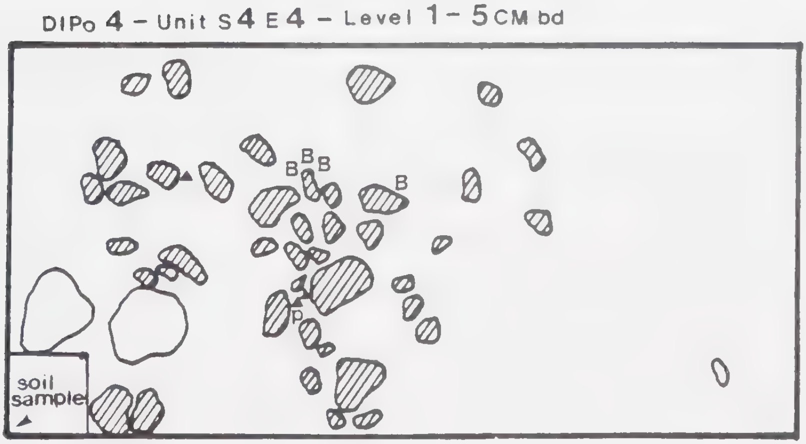
FIGURE 6 - Daisy Creek Site Feature Plans

DIPo 4 - Unit E6500 - Level 2 - 10CM bd



DIPo 4 - Unit S14 E4 - Level 3 - 15CM bd

DIPo 4 - Unit S4 E4 - Level 1 - 5CM bd



particular activity areas. The soil on which the hearths were built were not greatly burned nor discoloured, and charcoal occured minimally. Charcoal occurred in 7 out of 13 units, and much of it was in small fragments finely scattered in the sediments. This distribution may indicate that the hearths were not used intensively or for long periods of time. However, every excavated unit contained large amounts of fire-broken rock. There is a wide range of tool types and debitage with this rock scatter, an association which may indicate the variable use of the area as a multipurpose camp with random activity areas. The disemination or scatter of cultural materials may suggest that the entire location was utilized for a multitude of purposes several times (see Tables 4, 5, 6).

The majority of the fire-broken rock was severely fragmented and heavily stained. The scatter and intensity of the stain may relate to hearths not recovered in the sample; or as is more probable, they had been associated with the use of boiling pits to cook foodstuffs. One possible boiling pit was noted in Unit S13 E18 (see Figure 5). The pit, though, may not have been used as a boiling pit, but for some other undetermined function. However, similar pits have been excavated in the mountains and have been well interpreted as boiling pits (Brink, per. comm. 1983). The fire-broken rock scatter equates well with this interpretation as well as the condition of the faunal remains (see faunal section below). However, that the pits were used for roasting edible roots is not improbable. Root plants occur in large quantities in the local area. On the north side of Vicary Creek (Figure 1), edible Glacier Lilies litter the mountain sides. South of the Daisy Creek Site on the east slope of the Livingstone Range along Bob Creek large Camas areas were discovered. These extensive Camas areas are the most northern location of the species. Perhaps they were an added attraction to prehistoric people utilizing the Racehorse Creek drainage.

Faunal Materials

Tabulation of the unidentifiable and identifiable bone (see Table 9) indicated that the number of pieces and their weight varied from one unit to another with no observable consistent pattern. The bone was very friable, soft, and in an advanced state of disintegration. The condition of most of the bone suggests that it may have been well heated, cooked and/or processed for marrow. However, chemical weathering agents (see Chapter V) may have also contributed to the disintegrated state of the bone. The majority

TABLE 9 - DlPo 4 - Unit Bone Distribution

Unit	# of Pieces	Weight (grams)
S13E18	291	313.07
S1E2	15	35.17
S11E2	60	99.85
S14E4	443	374.88
S3E18	46	22.27
S5E12	252	917.19
S25E12	37	42.29
E65 00	26	48.45
S2 00	26	17.47
S4E4	362	142.70
S15E12	70	161.00
S34E18	28	36.33
S24E18	17	165.82
Testholes	96	287.73
Totals	1770	2664.22

of the unidentifiable bones were longbone fragments. Stratigraphically, the unidentifiable and identifiable bone did not concentrate into localized deposits or clusters within the strata. Perhaps the slightly higher frequencies in some units (e.g., S13 E18, S14 E4, S5 E12, S4 E4) was random and unintentional; however, much of the bone exhibited signs of severe burning, suggestive of cooking areas. The scatter of fire broken rock, macerated bone, and burnt bone may reaffirm the use of boiling pits to process animal foods. But other methods of cooking meat, such as roasting, were probably utilized as well.

The identifiable bone from Daisy Creek has all been recognized as the fragmentary remains of a single bison, though this fact was only determined because no two faunal elements were similar. The horse bones were found in surface contexts and are presumed not to be affiliated with the prehistoric materials. The identifiable bone includes:

Horse – proximal rib fragment – surface

– two cervical vertebrate fragments – surface

Bison – proximal phalanx and humerus fragment – Locality 7

– across Daisy Creek from site on first terrace

– left astragalus fragment – S5E12 – 16 cm bd

– left astragalus fragment – S5E12 – 8 cm bd

– left 2nd and 3rd fused carpal – S5E12 – 60 cm bd

– left metatarsal proximal end – S5E12 – 10–15 cm bd

– left calcaneus fragment – S5E12 – 10–15 cm bd

– right 2nd and 3rd fused cuneiform – S5E12 – 10–15 cm bd

– left fused 4th and central tarsal – S5E12 – 15–20 cm bd

– right lateral maleolus – S14E4 – 6 cm bd

– left upper M2 tooth – S14E4 – 24 cm bd

– right lower M1 tooth – S14E4 – 24 cm bd

– left proximal radius fragment – S13E18 – 18 cm bd

– left distal metacarpal – S24E18 – 14 cm bd

– left proximal metapodial – S24E18 – 15 cm bd

– left navicular cuboid – S15E12 – 19–24 cm bd

- left metacarpal - S15E12 - 23 cm bd
- right distal tibia fragment - S15E12 - 23-30 cm bd
- right upper M2 or M3 tooth fragment - S34E18 - 5 cm bd
- right upper P4 tooth - S2 00 - 17 cm bd
- right upper M1 tooth - S2 00 - 17 cm bd

The bison bone appears to contain all lower limb elements; whether this distribution was a function of butchering patterns at the site, the selected removal of bison parts from kill sites in other locations in the drainage, or differential preservation of elements cannot be ascertained. The presence of teeth at the site could indicate differential preservation and on-site butchering of the entire animal. Other lower limb fragments were recovered in other localities in the drainage but no cultural associations were observed.

Analysis of tooth cementum could give information on seasonality, however, the bison teeth from the Daisy Creek Site were too fragmented to allow successful attempts (Tim Schoewalter 1983 per. comm.).

Worked Bone

Four pieces of worked bone were unearthed in the excavation. In Plate 10 Figure a is a notched longbone fragment; Figure b is a flaked piece of long bone; Figure c a piece of beveled long bone; and Figure d shows a piece of bone with a drilled hole and some cut marks or scratches.

V. CHAPTER IV: THE RACEHORSE ROCKSHELTER

The 1982 test excavation of the Racehorse Creek Rockshelter, DkPp 11, was fairly successful in retrieving cultural and faunal materials. A transit was utilized to establish a datum within the shelter, and to construct a map of the shelter's location along the cliff ledge. The entire cliff is composed of porphyritic andesite, which is one of the most northern intrusions of the Crowsnest volcanics, (see Chapter 2 for the Shelter's geographical description).

The Shelter is very small in size and there was room for only about three 1 x 2 m units on the present floor surface. The height or the shelter at the lip was about five feet. The 1981 test, 50 x 50 cm, was placed approximately in the centre of the shelter, and in 1982 it was decided to excavate to the immediate south of the 1981 test. (see Figures 8 and 9) Due tc the methodology of the excavation, a time limitation, and the lack of a large field crew, only one 1 x 2 m unit was unearthed.

Methodology

The test location was subdivided into 50 x 50 cm units (refer to Figure 8). Regular excavating procedures were impossible because of the nature of the sediments. In the upper levels, these were humic, wet, and composed of a fine-grained black sediment which adhered to all larger objects, including roof-fall, bone, artifacts, etc., obscuring their true identity. The nature of these sediments made it impossible to separate the bone and artifacts quickly and with accuracy. Precise provenience was rarely determinable. This problem was resolved by using 10 cm arbitrary levels in 50 cm blocks. The blocks were removed by trowel and carted in metal buckets to a small fork of the Racehorse Creek approximately 1500-2000 metres from the shelter. Here the matrix was separated from the larger roof-fall. The sediment and finer roof-fall was washed in 2 mm screens. The larger bones and artifacts were removed immediately, and individually bagged and labeled according to respective blocks. All remaining matrix was then dried in the sun. It was noted that very little of the bone floated in the screen. Therefore, mere water flotation was impossible and other separation methods had to be incorporated. The water screened material was then placed in plastic bags and the entire unit of 17 levels

FIGURE 7 - Racehorse Shelter Contour Map

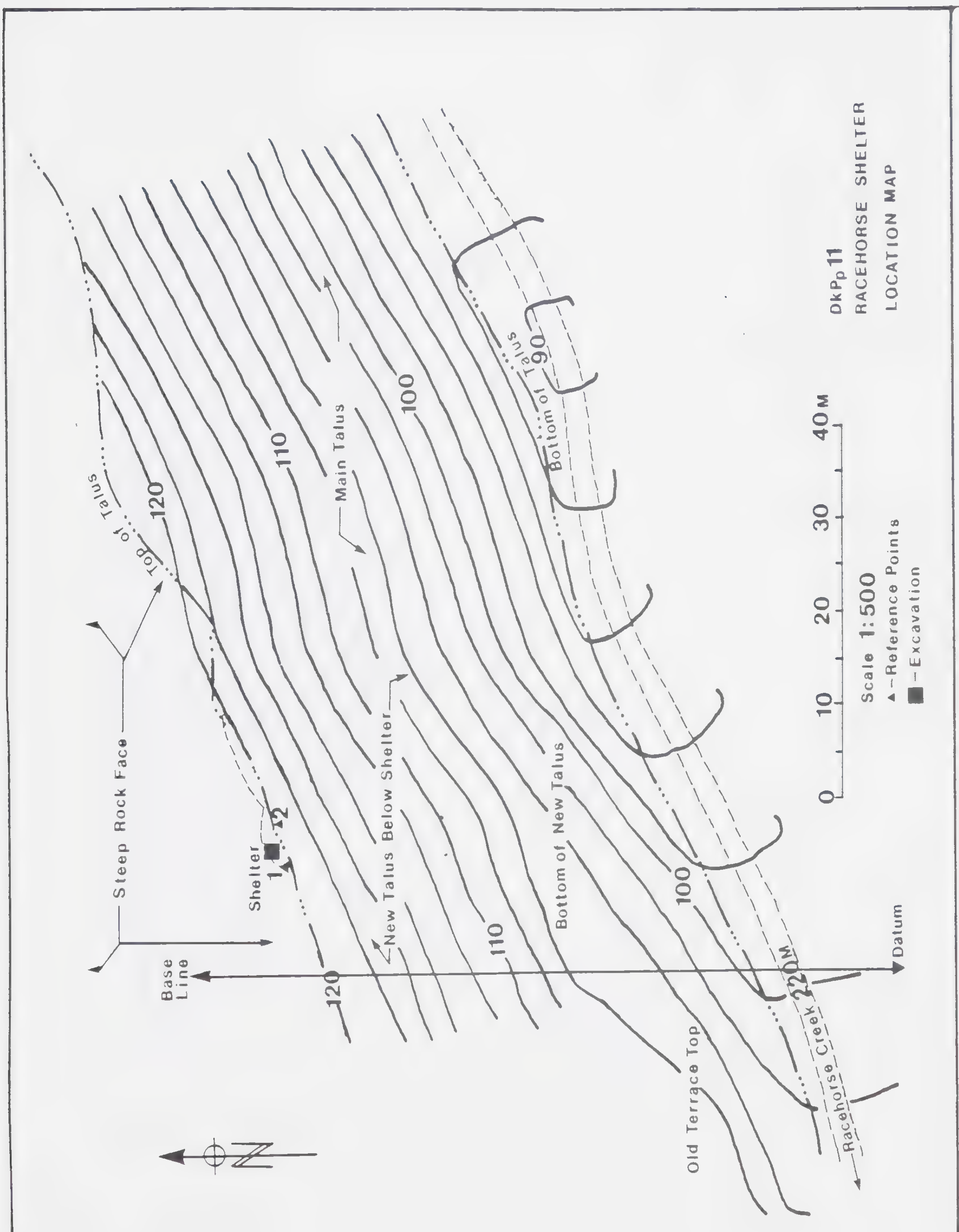
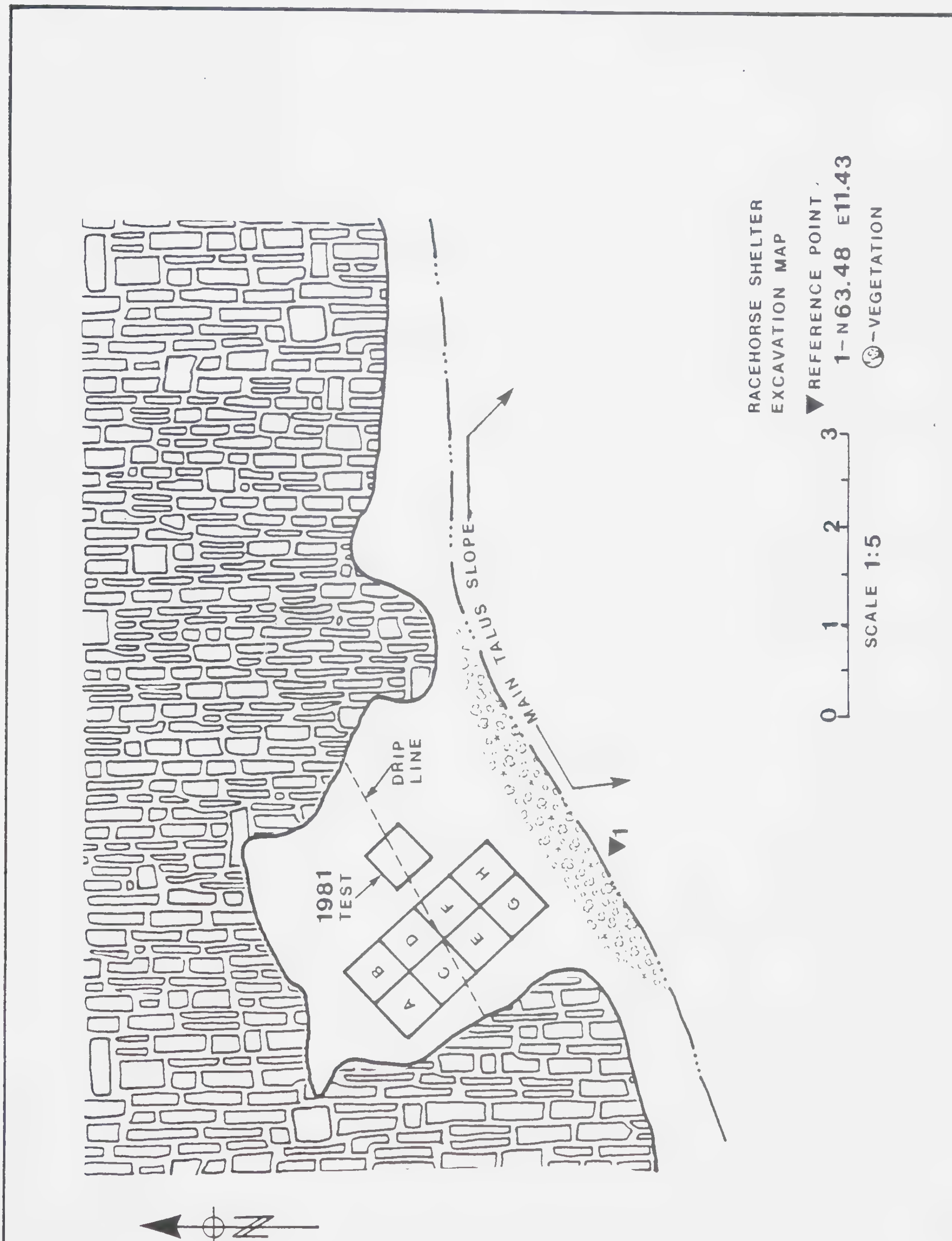


FIGURE 8 - Racehorse Shelter Subunits



were boxed and removed to the University of Alberta Anthropology Laboratory for further separation and analysis. Soil samples, totalling approximately 2 litres from block B, were also removed to the University for analysis. Unfortunately, this analysis had not been completed in time for the thesis. The excavation took four crew members one month to accomplish.

Laboratory Procedures

Over 600 total hours were spent with the assistance of two part time laboratory assistants to separate completely the remainder of the matrix from the bone and artifacts. A 10x neon lighted magnifier and dissecting tweezers were utilized in this task. Chemical separation (by ferric sulfate) of the bone from the matrix was not practiced because the specific gravity calculated was not sufficiently different from that of the matrix to allow complete separation (see Bodner and Rowlett 1980). The cost and gross amount of the chemical required, and a general lack of proper laboratory equipment made the hand-pick method best for this type of separation.

While the faunal remains were being removed they were sorted into anatomical element categories such as teeth, cranial bone, vertebrae, etc.. Unidentifiable bone (approximately 25,500 pieces plus 3367 unidentifiable tooth fragments (refer to Table 10) were grouped according to level and block; they were analysed further only for those taphonomic charateristics which were most easily observable, such as chew marks and general state of decomposition. Those identifiable elements were separated in the same manner as the unidentifiable remains; however, they were identified to species where possible. Bird, fish, and herpatological material were removed, as well as hare and woodrat elements, which were the only elements distinguishable from the mass of similar small mammal bone. The 1 mm siftings from the sediment analysis was also looked through but only teeth were removed.

Identification of the teeth was done in various laboratories using different comparative collections. The laboratories utilized were the Laboratory of Mammology, Zoology Department, University of Alberta; the Zooarchaeological Laboratory, Anthropology Department, University of Alberta, the Archaeological Survey of Alberta Zooarchaeological Laboratory; and the Provincial Museum of Alberta, Natural History

TABLE 10
DkPp 11 - Unidentifiable Bone

Level	Weight (grams)	Number of Pieces
1	37.36	850
2	66.50	2575
3	59.96	2212
4	79.75	2943
5	91.14	3447
6	92.77	3212
7	23.57	870*
8	14.19	523
9	12.78	470
10	17.16	654
11	17.12	531
12	37.76	1400**
13	48.28	1782
14	36.00	1329
15	31.11	1217
16	24.35	899
17	17.14	632
Total	706.09	25546

*note decrease
**note increase

Department Collections. The following is a list of those animals identified by teeth (2700 small mammal and 25 medium and large mammal), plus diagnostic bird and fish elements which could be identified. The herpatological materials have not been completely identified. The implications of these species to prehistoric man – enviroment relationships within the study area will be discussed below.

<u>Racehorse Shelter Faunal List</u>

(Dusky Shrew) <u>Sorex monicolus</u>
(American Water Shrew) <u>Sorex palustris</u>
(Hoary Bat) <u>Lasiurus cinereus</u>
(Pika) <u>Ochotona princeps</u>
(Snowshoe Hare) <u>Lepus americanus</u>
(Woodchuck) <u>Marmota monax</u>
(Hoary Marmot) <u>Marmota caligata</u>
(Columbian Ground Squirrel) <u>Spermophilus columbianus</u>
(Thirteen–lined Ground Squirrel) <u>Spermophilus lateralis</u>
(Golden Mantled Ground Squirrel) <u>Spermophilus tridecemlineatus</u>
(Least Chipmunk) <u>Eutamas minimus</u>
(Red Squirrel) <u>Tamiasciurus hudsonicus</u>
(Northern Flying Squirrel) <u>Glaucomys sabrinus</u>
(Beaver) <u>Castor canadensis</u>
(Deer Mouse) <u>Peromyscus maniculatus</u>
(Western Jumping Mouse) <u>Zapus princeps</u>
(Bushy–tailed Wood Rat) <u>Neotoma cinerea</u>
(Gapper's Red–backed Vole) <u>Clethrionomys gapperi</u>
(Heather Vole) <u>Phenacomys intermedius</u>
(Richardson's Water Vole) <u>Microtus richardsoni</u>
(Northern Bog Lemming) <u>Synaptomys borealis</u>
(Meadow Vole) <u>Microtus pennsylvanicus</u>
(Porcupine) <u>Erethizon dorsatum</u>

(Coyote) Canis latrans

(Red Fox) Vulpes vulpes

(Marten) Martes americana

(Ermine) Mustela erminea

(Long-tailed Weasel) Mustela frenata

(Least Weasel) Mustela nivalis

(Mink) Mustela vison

(Deer) Odocoileus sp.

(Wapiti) Cervus canadensis

(Bighorn Sheep) Ovis canadensis

(Spruce Grouse) Canachites canadensis

(Dipper ?) Cinclus mexicanus

(Hawk or Owl ?)

(Yellowheaded Blackbird ?) Xanthocephalus xanthocephalus

(Pine Grosbeak or Waxwing ?) Pinicola enucleator or Bombycilla sp.

(Chestnut Collared Longspur ?) Calcarius ornatus

(Trout) Salmoninae sp.

(Whitefish) Coregoninae sp.

(Salamander ?)

(Snake)

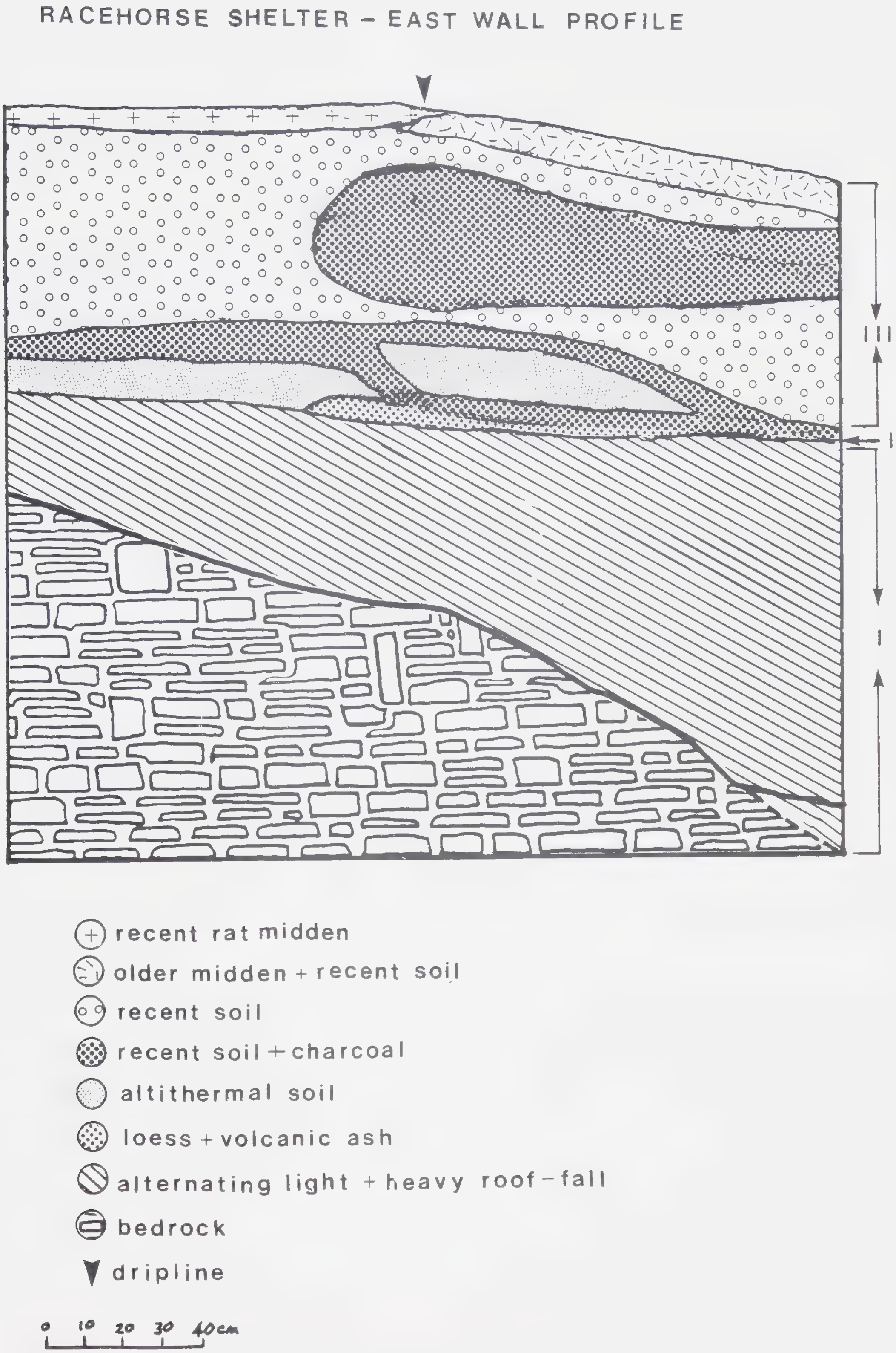
(Toad or Frog)

Sediments

Though sedimentological analysis is yet ongoing and the exact nature of the deposits is largely inferred, they appear to separate into three distinct zones (see profile Figure 9).

Zone I overlies bedrock and is composed of layered sediments mainly of distinct bands of light and heavy roof - spalls. These layers total approximately 80 - 90 cm of the entire deposit and the main matrix appears to be a fine grained soil of mainly colluvium materials. Their colour is grayish brown (10YR 5/2).

FIGURE 9 - Racehorse Shelter Profile



On top of Zone I is a possible thin cap of loess, however, it may be an integrative band, a mixture of the Zone I and II contact. Zone II contains a fine textured sediment of probably colluvium. Mazama ash may be finely dispersed throughout this zone (Choquette 1983: per. comm.). A charcoal 10 cm lense is capping this zone as well as integrated into it outward from the dripline. This lense may represent recurrent hearths. Zone IIs colour is dark grayish brown and is thought to be an Altithermal soil.

Zone III contains recent colluvium and organic sediments interspersed in large quantities of roof – fall. The soil is wetter than Zone II and is more humic in content and sticky in texture. A large layer of soil and charcoal mixture is present outward from the dripline and may represent a more recent hearth area. A 10 – 15 cm cap overlays Zone III and represents recent and reworked rat midden deposits. Zone III colour ranges from very dark gray (10YR 3/1) to very dark grayish brown (10YR 3/2).

Features

In 1981 the small test disturbed a sub-surface hearth 50 to 60 cm bs. A great amount of large mammal burnt bone in small white, chunky fragments including charcoal residues was noted. The 1982 test excavation did not actually encounter this same hearth though fragments of charcoal (30.82g) were collected from most levels of the excavation and they could have been from one or a series of hearths. The nature of the sediments made it difficult to discern definite charcoal accumulations; however, the profile (Figure 9) does show a mixed charcoal-sediment lens which may be a hearth remnant. A total of 123 pieces of bone (16.05g) were definitely burnt, and the majority were of large mammal remains (see Table 11). These bones were found mainly in the cultural deposit from Level 2 to Level 5.

The burnt bone, hearth, and the list of cultural materials indicates that the shelter was probably utilized at intervals for short periods of time by small groups of hunters who used the shelter as a small camp/workshop/ lookout station.

TABLE 11

DkPp 11 - Burnt Bone

LEVEL and SUBUNIT	NUMBER of PIECES	WEIGHT (grams)	LARGE MAMMAL	SMALL MAMMAL
2A	5	.51	x	
2B	7	.35	x	x
2C	4	.50	x	
2D	14	1.39	x	
2E	2	.09	x	
2G	2	.04		x
3A	3	.18	x	
3B	3	.21	x	
3C	4	.59	x	
3D	7	1.00	x	
3E	2	.24	x	
4A	10	1.30	x	x
4B	12	2.78	x	
4D	12	2.02	x	
5A	6	1.27	x	
5B	16	1.13	x	
5E	6	.21	x	x
5F	5	.25	x	
8D	1	.28	x	
8E	1	.04		x
9G	1	.08	x	
TOTALS	123	16.05		

Lithics

The majority of the flakes (see Table 12) come from Level 5. A date of 3050 – 130 BP (Beta Analytic) on charcoal from Level 5 is presumed to be a good date. The flakes are retouch/shaping flakes; and are mainly of gray, white, and brown chert, except for one of Montana Chert. The gray chert is of the High Rock Range variety, the white is possibly Etherington, and the brown is of an unknown origin. Some siltstone/mudstone debitage, probably of local origin, was also recovered. The black chert flakes may be from a source near Waterton.

The tools recovered include an andesite borer (Plate, 4 Fig. e – Level 5), a quartz 'teardrop' scraper (Plate 3, Figure d – Level 5), a Top of the World Chert knife or projectile point (Plate 3, Figure I – Level 5), a Pelican Lake-like projectile point (Plate 2, Figure f – 1981 Test – 50 cm bs) Late Middle Prehistoric ca. 2000 BC – AD 400 (after Reeves 1983), an igneous basalt stemmed projectile point (Plate 2, Figure k – Level 6), and small pieces of ochre in Levels 5 and 6.

The location and abundance of artifacts in Levels 5 and 6 (50 to 70 cm bd) suggest that these levels contain the major occupation zone at the shelter. The artifacts also suggest that besides cooking game animals here, the hunters fashioned different types of tools from at least seven different types of lithic material. Whether these tools functioned within the shelter cannot be ascertained.

The large and medium-sized animals (for this study medium sized is between porcupine and sheep) could have been hunted near the Shelter. Whether the small mammals, birds, fish and herpatological remains suggest diverse collection and/or trapping strategies is discussed later. What first must be considered is the taphonomic additive and subtractive factors which contributed to form the deposit within the shelter. This information is necessary, for it allows a clearer interpretation of the human and environmental relationships inferred from the faunal remains. A series of carbon dates submitted to the Saskatchewan Research Council through the Canadian Government have not been processed as yet. This lack of a definite time control does not allow confirmation of the interpretation. Much of the following then is based on assumption. However, hopefully, the assumptions are reasonable. By exposing the taphonomic variables at work in the shelter, interpretation should be more reliable.

TABLE 12 - DkPp 11 Artifacts

Level	Flakes	Tools	Ochre
2C	3		
2F	2		
3D	4		
4D	15		
4E	2		
4F	1		
4H	1		
5A	2	scraper	
5B		borer	
5C	1	knife	
5E	2		
5F	1		1
6B	4		3
6C	3		
6D	7		
6E	6	p.pt.	
6F	3		
6G	1		
6H	3		
7A	9		
7D	2		
7E	1		
7G	1		
7H	1		
2*	1		
5*	2	p.pt.	
6*	2		2

*1981 test

TABLE 13 - Woodrat Teeth

Left	Right
Lower	
M1 = 60	M1 = 55
M2 = 117	M2 = 111
M3 = 60	M3 = 79
Upper	
M1 = 74	M1 = 83
M2 = 167	M2 = 148
M3 = 8	M3 = 9

VI. CHAPTER V: THE TAPHONOMIC IMPLICATIONS

Taphonomy is the study of the processes of burial and the fossilization of bone (Behrensmeyer 1976:36). For a complete breakdown of the entire study of taphonomy and its effects on interpretation of a faunal assemblage refer to Clark and Kietztki (1967 – also see Graham 1983, Behrensmeyer and Hill 1980). Only those taphonomic processes relevant to the interpretation of the Racehorse Shelter assemblage are discussed below.

Weathering Agents

Weathering agents have a pronounced and destructive effect on faunal remains. These agents include climate, the type of physical environment, chemical agents, and others. Weathering can separate and rapidly destroy small mammal bones quicker than larger mammal bones (Behrensmeyer 1978:153). Temperature, moisture, geochemical processes, and hydrodynamic factors are principal agents (Bonnichsen 1979:26).

Constantly changing weather patterns due to seasonality have severe effects on preservation, especially on a micro-scale. The rate of variation in preservation would be unpredictable because each bone assemblage may have been subjected to different modes and degrees of climatic deterioration and disturbance. Only a few of the larger mammal bones in the site exhibit the effects of climatic weathering of the effects noted by Behrensmeyer (1978) where bone is severly flaking in layers. However, not enough large mammal bone exhibit this type of deterioration to state positively that a weathering factor was at work.

The smaller mammal bones are more fragile and are less resistant to climatic weathering than are the larger bones. Teeth and skull fragments should preserve longer than post-cranial elements subjected to climatic weathering. But even resistant teeth may disintegrate with extremes in temperature and moisture, such as freeze-thaw cycles (Behrensmeyer 1976:37). It was noted that the snowshoe hare teeth in the shelter because of their particular morphology, deteriorated more than certain other cranial parts such as the zygomatic. As well, individual teeth from one species may deteriorate differentially, as Table 13 may indicate. In Table 14 one can note the discrepancies made on MNI (Minimum Number of Individuals) counts caused by this differential weathering process. But, as shown in Table 15 smaller bird and snake bone was found at nearly all

TABLE 13 - Woodrat Teeth

Left	Right
Lower	
M1 = 60	M1 = 55
M2 = 117	M2 = 111
M3 = 60	M3 = 79
Upper	
M1 = 74	M1 = 83
M2 = 167	M2 = 148
M3 = 8	M3 = 9

TABLE 14 - DkPp 11 MNI Counts

Level	Rat Bone	Rat Teeth	Hare Bone	Hare Teeth
1	6	11	4	5
2	9	15	4	3
3	6	13	4	2
4	6	23	5	5
5	5	25	3	1
6	5	29	5	3
7	2	10	1	1
8	2	10	2	4
9	2	7	1	1
10	2	7	2	1
11	4	5	3	1
12	4	8	6	1
13	4	7	4	1
14	4	8	4	1
15	4	7	4	2
16	2	7	3	1
17	2	2	1	1

TABLE 15 - DkPp 11 Specific Fauna

Level	Toad/ Frog	Fish	Salamander	Snake	Bird
1		x			x
2		x	x	x	x
3		x		x	x
4	x	x		x	x
5		x		x	x
6	x			x	x
7				x	
8					
9		x		x	x
10				x	x
11					x
12				x	x
13	x				x
14				x	x
15				x	x
16					x
17				x	x

unit levels. Unfortunately, there have been no experiments in different micro-environments to determine weathering stages or diversity in deterioration of small mammal bone.

Great losses of bone could occur as a consequence of hydraulic actions (Lawrence 1968:317). Water acting on the bone will produce abrasion and rounding, and may orient the bone in the direction of the water flow (Isaac 1967:33). Small mammal bones are easily washed away, and can be deposited great distances from place of death. Water washing the downhill surface of the rock slopes above the Shelter may have caused some of the accumulation. Water may have put bones from different micro-habitats within reach of the scavengers who utilized the Shelter. However, cursory examination of the bone did not reveal a large amount of rounding, and it could not be determined whether water rounding was distinguishable from other types of deterioration processes.

Though wind can easily transport smaller bones it can also act as an agent of wear. Wind-blown particles of fine sediment can quickly abrade and wear away tiny bones (Brain 1967:98-99). This type of abrasion could not be discerned on the bone from the Racehorse Shelter, which is well protected from the wind.

Chemical weathering of soil acids and salts can also rapidly deteriorate bone of all sizes. These acids and salts can be formed by the microbial decomposition of the collagen itself (White and Hannus 1983) or because of the specific properties of the soil. Forest soils tend to be greatly acidic and cause rapid decomposition of bone (as at Daisy Creek). Chemical weathering weakens and collapses bone structure and causes pitting and rounding of the bone surface (Binford and Dertram 1977:112, Morlan 1980:35, Bonnichsen 1979:30, Behrensmeyer 1978:154). Only on a few of the larger mammal bones in DkPp 11 was some pitting noted of the kind equatable to chemical processes. However, none of the smaller bone exhibited this pitting, and it is suggested that this larger mammal bone may have been transported into the shelter from elsewhere. Chemical weathering is assumed to have been a minimal disturbance because of the overall good condition of the majority of small mammal bone in the shelter and the high degree of preservation of identifiable elements.

<u>Carnivore Alterations</u>

There is a trophic relationship which dictates that there be "more prey than predator in a given area (Grayson 1978b:80)." Usually the skeletal representation of the prey species in a zooarchaeological site will give little indication of the possible predators which perhaps were major contributors to much of the bone accumulation. Predators may also be one of the major contributors to creation of a mixed faunal assemblage.

Fortunately, the Racehorse Shelter deposit gave an ample record of some major predator species, including: red fox, coyote, marten, ermine, least weasel, long-tailed weasel, mink, and owl or hawk. What these predators consume at their kill sites, leave behind, or carry to their lairs, nests, or caches is not documented and studied. Other similar carnivore studies (Binford 1981; Behrensmeyer and Hill 1980; Brain 1981) cannot be compared to the ones found in the shelter because of the assumption of variation between species. Also these particular studies tend to have certain drawbacks when application is made to the past natural or human situation (for example see Isaac 1983). This type of information though, is important in interpreting aspects of bone accumulation and dispersal (Khatri 1975:36).

Because the Shelter occupied a geographical position among different habitats compacted into a relatively small area, we could expect, even with minor changes and fluctuation of environments through time, that a variety of predators could co-exist, selecting preferred or available prey species from a variety of habitats. This aspect could explain well the reasons for mixed assemblages in particular sites.

The predators listed above are all capable of killing either in the Shelter or in the immediate area, the small mammals, birds and/or fish. The coyote, red fox, marten, and mink are capable of killing each other as well as beaver and porcupine (See faunal list Chapter 4 and in Table 16). The coyote (wolf was not found in the deposit but does occur in the area today) is the only predator represented which is capable of successfully dispatching the larger mammals. Minks are especially fond of fish (Rand 1948:91), and often cache them in places similar to the Shelter (Wayne Roberts, per. comm.). Long-tailed weasels are fond of ground squirrels (Soper 1964:309), least weasels and ermine of smaller rodents (Rand 1948:86, Soper 1970:56), and martens of pine squirrels (Davis 1939:132). Any of these carnivores could have utilized the Shelter as a den or lair

through the prehistory of the site, and contributed their particular prey preference to the zooarchaeological record. As well, owls are very adept at hunting nocturnal flying squirrels. Owls may be the main contributor of flying squirrel remains in the site (see below for more on owl predation). However, even squirrels kill and eat smaller mammals (as well as cannibalize) and searches through the literature show that the majority of smaller mammals and birds will kill and consume a variety of animals when the opportunity or preference arises (see for example Soper 1973, 1964; Rand 1948; Davis 1939; Brown 1968; MacClintock 1970; Muul 1968).

All the predators in the faunal list above can have hunting territories that extend over all the available habitats at and near the Shelter, although it is the larger predators that may totally consume their prey. Digestive acids may modify the bone. The bone may be crushed and ground by teeth action, but no teeth marks of larger carnivores were noted on the bone from the Shelter. But eaten whole, small mammal bones may have a characteristic polish and dissolved appearance after having been passed as fecal matter. None of these characteristics were noted on the Shelter bone; however, traces such as these may quickly disappear once the bone is exposed to surface weathering. Sharp and pointed edges, the kind produced by carnivores (Behrensmeyer 1978:154) may also quickly be destroyed.

The study of fecal droppings and their fossil accumulations is known as coprocoenosis (Mellet 1974:341) Mellet found that in certain coprolites bones may show breaks at identical loci, and many of the small mammal remains will be still articulated. However, it can be expected that each species consumed will not show similar patterns in the coprolites of the various predators. Sometimes an assemblage may contain an above normal amount of particular elements introduced as scat material (Brant 1962:167). However, this feature may also vary with the species, and it is nearly impossible to determine what constitutes an above normal representation. Each assemblage will be different. Coyote coprolites were found on the surface of the shelter but none could be discerned in the deposit. Coprolites must be found intact for definite identification; yet their disintegration would be expected to be rapid, especially in moist deposits with strong seasonality.

Owls or hawks are represented in the site. They can devastate small mammal populations and cause great frequencies of pellet accumulations, especially at their nests and aeries. If the Shelter was used as a nestsite or aerie, then owls or hawks must be considered as a major contributor to the mixed assemblage. Their predator-prey relationship is important because some, such as the barn owl (Pearson and Pearson 1947:137) or the snowy owl (Pitelka, Tomich, and Treichel 1955:101) may for a period of time, subsist on and hunt only one species even though others are available in the local environment. Other raptors in the same area at the same time as the selective raptors may sample all species randomly (ibid.:103). This kind of hunting behaviour can seriously bias the bone assemblage and distort the environmental reconstruction, especially if raptors were sampling different habitats than those near their nests or aeries.

Not much is known about the predation ranges of a large body of raptors. Estimates could be made by careful observation, banding, radio transmitters, and through the examination of pellet materials. Snowy owls, for example, while not migrating, may have hunting territories of two to four square miles (Ibid). Some large birds (other owls, hawks, eagles etc.) may have extended hunting ranges up to and exceeding eight square miles, and this range may extend over vast wasteland and/or water (Walker 1978:233). However, it is difficult to predict the hunting ranges of these larger birds when they are migrating. Raptors then, can sample a number of micro and macro-environments. Mountain raptors also may sample ecological habitats up and down the slopes of mountains and thus also create similar biases to a bone deposit.

Though some authors (e.g., Swanson, Butler, and Bonnichsen 1964: 49) doubt whether the larger of small mammals could be carried from other habitats into caves or shelters and be deposited in the bone assemblage by this means, one has to consider the enormous strength of some raptors. It would be no problem for a large owl to carry a rabbit, woodchuck, or opposum into a cave(Wayne Roberts per. comm.).

There are many sites where varied lifezones or habitats are represented and indicate an ecological mixture (see Kurten and Anderson 1980 for various examples). One could expect that in a mosaic environment or in ecotones that raptors and carnivores could very easily sample many habitats and create mixed assemblages at their roosts and lairs. Over time, only with a continual non-sporadic sampling of the local and regional

environment may their pellet and coprolite accumulations show the variety of diet changes or changes in environmental conditions that affected relative and actual quantities of prey species.

Pellets from raptorial birds may not preserve. Pellets contain regurgitated masses of hair, bone, and other organic matter. If a microtine is eaten whole it would take six to sixteen hours to be digested and another six to eight hours before the pellet is regurgitated (Walker 1978:232) giving the raptor ample time to relocate before regurgitation. Depending on the size of prey and type of predator, the pellets may contain anywhere from one to two animals each, or fractions thereof (Pearson and Pearson 1947:139).

Some archaeologists (e.g., Miller 1979) are quick to assign microfossil collections in sites to the predatory behaviour of raptorial birds. Few, if any, give adequate reasons for this judgement. There have been few instances where actual pellets have been recovered in an archaeological context. At Council Hall Cave in eastern Nevada, Miller(1979:319) found long bones and vertebrae of rabbit and other microfauna loosely adhered together by masses of fur and sometimes vegetable fiber. The accumulations, interstices, canals, and marrow cavities were impacted with fur, fiber, and bone. Miller was unable to determine whether they were pellets or coprolites. If the microfauna was not eaten whole, then pellets may be discernible due to the shearing effects of beaks on the bone (Guilday and Adam 1967:27). It is not clear how to distinguish a shear from other abnormal breakage of bone, and no such experiments are known to the author. No pellets or bones with abnormal shearing were noted at the Racehorse Shelter. The Shelter's location and basic form does not appear to be conducive to housing raptors. Raptors may have had little to do with the accumulation of the major part of the assemblage, though minimum influence cannot be ruled out.

Human Collecting

The human occupants of the Shelter cannot be ruled out as possible contributors to the small mammal bone accumulations. Many other archaeological sites with a relatively high frequency of small mammal remains have led to inferences and speculations concerning the diet of prehistoric man. Archaeologists may assign these high percentages

to the relative extent of available habitat for the species concerned rather than to cultural or social preferences for food (see Marwitt, Fry, and Adovasio 1971:33). Other archaeologists (such as Johnson 1977: 65) state with assurance that all major prehistoric groups appear to have eaten smaller mammals when they were available. However, there are few criteria used in both cases.

Often, if small mammal bones are included in the same cultural layer and absent from non-cultural layers, utilization is inferred (Guilday and Adam 1967:27, Miller 1979:287, Frison 1977:99-114, among others). However, many of these small mammals may have been attracted to the human cultural deposits and the residues left by the prehistoric occupants of the site. No such divisions were noted at the Shelter.

Johnson (1977:65) states that animal remains recovered from hearths and burned remains "leave little doubt as to their utilization by man." Some sites, such as Sisters Hill in north-central Wyoming, contained charred bones of porcupine, ground squirrel, and other small rodents (Agogino and Galloway 1965:116). Yet, many of the burnt remains of small mammals could be the result of forest or grass fires, from rodents carrying the bone into the site, or due to hearths being built on top of already existing subfossil accumulations of bone. Few small mammal remains at the Shelter were burnt, and there was no consistency to their pattern of occurrence in the deposit.

Only if the small mammal bone was in definite concentration areas such as in boiling pits and the like, or if the bones themselves exhibited definite butchering marks or patterns, can we possibly infer human utilization. At the Brynjulfsaon Caves in Missouri, at Cave #2, there is evidence of butchering marks on raccoon bones (Parmalee and Oesch 1972:9). Other cases such as this are clearly medium-mammal remains and not small mammal. The only site known where small mammal remains show any <u>regular</u> <u>butchering</u> <u>pattern</u> is at Lubbock Lake (Johnson 1977:72). There are good indications that the rabbits were processed. Muskrat was associated with all rabbit processing areas. Both bones showed definitive butchering marks as well. However, Johnson (ibid.) still states that "natural death cannot be ruled out." There were no butchering marks or processing patterns noted from the Racehorse Shelter remains. Excavation in blocks may have erased the patterns, but the bones showed no evidence of butchering.

It has been common for archaeologists to use ethnographic analogy to infer utilization of small mammals by prehistoric groups. For instance it is known that small mammals were part of the main diet of the Paiute (Forde 1934) and the Shoshone (Steward 1953). Squirrels (ground and pine), gophers, rats, and rabbits were hunted. Some tribes, such as the Naskapi (Henriksen 1973) hunt hares and squirrels only in times of scarcity. The Naskapi say that they would never eat mice or lemmings (ibid.). For more such references to small mammal utilization by ethnographic groups refer to Graham (1983:11-15). However, we must do more than raid the ethnographic record for examples to support generalized assumptions concerning prehistoric populations. More physical evidence is needed. We cannot infer a hunting and gathering strategy from large amounts of microtine remains in a site, as we do for larger game animals. Though microtines may be abundant in an area, at 250 or more per acre, their mean weights would give some five to ten kilograms of meat per acre (Brant 1962:164). Stahl (1982:823) found "a consistently high ratio of edible meat to total body size" in many types of rodents. He suggests that the orders Insectivora and Rodentia, "may have been important elements in prehistoric diets." However, I speculate that the time and effort expended in gathering many of these species would not be profitable in terms of energy expended to energy returned. One cannot calculate with accuracy what a prehistoric group may have done, or the decisions they may have made about utilizing small mammals until we can document more physical evidence. No such evidence could be detected from the Racehorse Shelter. Thus human contribution to the small mammal accumulations is speculated as being nil.

Scavenging

Scavanging of carcasses for various purposes is done by a variety of animals and insects including man. It can be done in a selective or random nature. Though all animals may scavenge at some point throughout their lifetimes, the most active scavenger represented in the Racehorse Shelter is the woodrat.

Scavenging usually occurs on animals that die of disease, drowning, or of old age, though more predictably from the kills of the larger carnivores (Read-Martin and Read 1975:364). The effects on the skeleton are dismemberment and the displacing of elements. This process destroys identifiable portions or the entire bone. Over 25,000

pieces of mainly unidentifiable bone recovered from the Shelter exhibited excessive chew marks. Most of these pieces were of small mammals; few large mammal bones showed similar markings. Woodrats, being notorious collectors, can transport bones ranging in size from mice to deer (Finley 1958: 349). The bones serve as building material for dens; they are gnawed for calcium and other dietary elements, and for keeping incisors in trim. During excavation, it was noted that large bones in the Shelter were actively moved about daily by the woodrats. Because the woodrats were well represented at all stratigraphic levels, and it is assumed that these animal populations were the major contributor to bone accumulation and species representation.

Woodrats, though a definite disturbance factor at the Shelter, may also have been useful by providing local paleo-environmental data. Some reasons why rat accumulations may be reliable indicators are:

(1) They nest in the same locality for generations, sometimes for hundreds of years (Miller 1979:290).

(2) They sample local vegetation (and scavenge bone) inadvertently.

(3) They sample an area of not more than one hundred meters (Thompson 1979:363).

(4) They deposit feces, urine, and scavenged material in certain consistent spots.

The ecological inferences made below are mainly based on the calculations of represented species and their co-existence in the Shelter and also on the interpretation of the bone assemblage as a continual rat midden and thus a fairly reliable paleo-environmental record. However, one must keep in mind the other taphonomic variables (differential preservation and thus differential representation) which can lead to misinterpretations of the record.

Representation and Ecological Inference

Representation in a zooarchaeological deposit is calculated by identifying the species and their numbers present. (Table 15 and 16) (refer to faunal list this chapter) Basically, representation of individual species is subsumed in the zooarchaeological literature under the concepts of minimum number of individuals (MNI). It is beyond the structural requirements of this thesis to give the details and/or examples of each MNI

Table 16 - <u>Racehorse Rockshelter MNI Tooth Count</u>

Species/Level	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Least Chipmunk			01	01		02											
Jumping Mouse		01															
Hoary Bat												01					01
Water Shrew			01											01			
Dusky Shrew						01	01		01			02					
Deer Mouse				01	01	02	01	01				02			01	01	01
Northern Bog Lemming		02													01		
Heather Vole	01	07	05	20	04	12	04	01	05	01	01	04	05	02	01	02	04
Red-Backed Vole	03	19	13	11	07	08	03	01	02	02	04	03	01	02	01	01	01
Meadow Vole	03	11	04	06	07	13	04	04	02	01	01	06	05	02	03	03	02
Water Vole		01	02		02	01	01	01	01	02	01	01	02	01	02	01	02
Mink			03														
Long-Tailed Weasel	01	02	01	01	01										01		
Least Weasel			01		01												
Ermine	01		01			01											
Martin		01	01									01					
Woodrat	11	15	13	23	25	29	10	10	07	07	05	08	07	08	07	07	02
Columbian G.S.	01	01	01	01													
Thirteen-Lined G.S.	02	02	01		01												
Golden Mantled G.S.	01			01	02							01					
Northern Flying Squirrel	02	04	01	02	01	01								01			
Red Squirrel	01	02	01	01	02	02	01	01	01		01	01	02	02			01
Pika		01						01					01				
Showshoe Hare	05	03	02	05	01	03	01	04	01	01	01	01	01	01	02	01	01
Woodchuck	01	01			01												
Hoary Marmot		01			01			01									
Red Fox		01	01														
Porcupine	01		01		01		01	01	01								
Beaver				01		01		01									
Coyote	01																
Sheep	01	01			01			01									
Deer	01	01						01									
Elk						01											
Marmota sp.							01					01					
Sorex sp.					01												
Eutamus sp.													01				

concept. For the various methods and their criticisms refer to Thomas (1971), Grayson (1978a), Chaplin (1971), Krantz (1968), Bokonyi (1970), Casteel (1977), White (1953), Morlan (l983), Bobrowsky (1982) and Shotwell (1955). All these methods have major inherent problems in that too often the MNI information is used to generalize beyond the limits of the data. At best, MNI refers only to the elements collected and/or excavated and those diagnostic enough to identify to species. Table 16, the MNI counts for the identified teeth were tabulated using Whites'(1953) basic method. In this method, as an example, if there were twenty lower left M3s and ten lower right M3s of a particular specie per level, then the MNI of that species for that level would be twenty.

Many problems are evident in utilizing MNI for climatic or habitat recontruction. As noted above, taphonomic processes could potentially disturb the bone deposit in many ways that would skew interpretations of MNI indexes. The other major problem is sampling. Most analysts would agree that accuracy greatly depends on sample size (Casteel 1977a;238; Grayson 1978a: 54; Krantz 1968:288, among others). The MNI values are a function of sample size (Lyman 1979:537). In other words the more area sampled the more species and/or their numbers would be represented. Casteel's (1977b:143) view is that serious distortions could arise when sample sizes of less than 1000 bones are used. In the Racehorse Shelter 3750 teeth were used to calculate the MNI index. This sample is considered approximately 1/3 of the total deposit and a good representation of the faunal remains of the shelter and the immediate area. However, because the stratigraphy is not clear and arbitrary levels were used to separate the sample, a picture of the actual species composition through time may not be accurate. Yet, between Levels 7 - 8 a distinct sediment change was noted and MNIs correspondly increased in values and species types. The sediment change, though an inferred response of climatic change, may have functioned to skew the actual numbers of species and the quantitative number among each specie. If the sediment change is actually real then perhaps preservation and representation below Levels 7 - 8 was different than in the upper levels thus ecological reconstruction may be accurate.

Only a few species continue through time, as they are represented in each level. These include snowshoe hare, woodrat, meadow vole, red-backed vole, and heather vole. There are no mirrored images reflected in their MNIs; one does not increase while the

other decreases. These types of mirrored images are favoured archaeological tools that are used to suggest climatic and/or habitat changes through time. They can reliably work only where sample size is large enough and the species in question are different enough to observe the changes with clarity. Few zooarchaeological sites contain mirrored images of small mammal populations which could infer climatic change. At Dirty Shame Rockshelter, Idaho, mesic and xeric differences were suggested by differences in Nuttalls Cottontails and Yellow-bellied Marmots (Grayson 1977). Graysons population estimates were based on E (number of identifiable elements per taxon) and MNI counts. There was no way to determine positively which identified elements within a taxon had been contributed by a given individual, however, the MNI counts suggested to Grayson that a major climatic change occured at 7000 BP with a decreased shift in effective precipitation.

At Wilson Butte Cave, Idaho, (Gruhn 1961) thirty-one small mammal species seemed to reflect a change in climate as that postulated by Grayson. In Wilson Butte, species needing water replace semi-arid micro-fauna. However, Gruhn does not state how the total number of specimens and the percentages of frequency distributions were determined.

At Owl Cave, Idaho, (Miller and Dort 1978, Guilday 1969) similar ratios of geomorphs to lagomorphs determined changes in grassland and sagebrush habitats. Individual small mammals (7248) were determined from lower jaws and though various habitats were suggested, contrary to the other sites listed above, the climatic optimum (Altithermal) could not be pinpointed. Drastic changes were not reflected in the small mammal components.

Owl Cave is similar to other sites such as the Bison and Veratic Rockshelters at Birch Creek, Idaho, (Swanson 1972, Swanson, Butler, and Bonnichsen 1964) and Meadowcroft Rockshelter (Adovasio and Gunn, et al. 1978). At these sites, though a large amount of small mammal remains were found, they only indicated a mixture of species with no evidence of mirrored images. It is suggested that major features of biota remained unaffected by micro-climatic adjustments from 9000 B.C. until the Historic Period.

Thus the environmental reconstructions based on faunal changes in these sites conflict with each other. Changes may be specific only to the immediate habitat area

surrounding the site. Probably every site location was within a different ecological sphere; thus all the faunal records and their consequent analytical inferences should be expected to be different from each other. Uncertainty also surrounds the authors' interpretations of the changes due to the possibility that many of the MNIs were actually constructed on predator and/or raptor selective samplings of the environment and not the result of real climatic/habitat changes.

A limited search through the literature showed that often the reports on small mammal data were vague and much too generalized. Faunal types may be listed but MNIs and the taphonomic assessment of the deposits are not described and perhaps were misinterpreted. Many sites (such as some listed in Kurten and Anderson 1980; or see Slaughter 1975, Johnson 1974, Lundelius 1967, and Kozlowski 1982) appear to have been located in diverse habitats; and very generalized climatic descriptions (such as 'warm', 'dry', 'cool' and so forth) accompany inferred changes. Clearly, more precise descriptions are needed (Bryson, et al. 1970:53). Paleoenvironmental reconstructions, if not general (using the zonal hypothesis descriptions), are even more vague (using the mosaic hypothesis descriptions); and the reasoning is not fully documented nor supported with concrete evidence. The small mammal species occurrences and co-existence through time tends to support a mosaic description for most of the record at the Racehorse Shelter. But these assumptions are tenuous, as noted below.

Pearson Correlation test (spss computer package) was used with the MNI data from the Racehorse Shelter. The first run was done between levels where the significance of all species between each level was tested. The results were insignificant because there were no observable fluctuations between the levels through time. The second run was done among each species MNI per level. A number of possibly significant correlations occurred. However, all of them bordered on the assumption that the arbitrary levels were real divisions in time. As well, it could not be ascertained that the deposit sample from each level was equal; in a rockshelter or cave it is difficult, if not impossible, to determine if the bulk samples from each arbitrary level are similar to each other due to sporadic intervention of roof-fall and the slope of the bedrock determining the angle of deposition. Figure 9 shows that sub-levels or blocks were lost as depth of excavation increased. These stratigraphic factors alone (even without taphonomic considerations)

would tend to make correlation tests and MNI configurations unreliable. Thus the information derived from the Pearson correlation is not presented in the thesis nor are inferences made from those results.

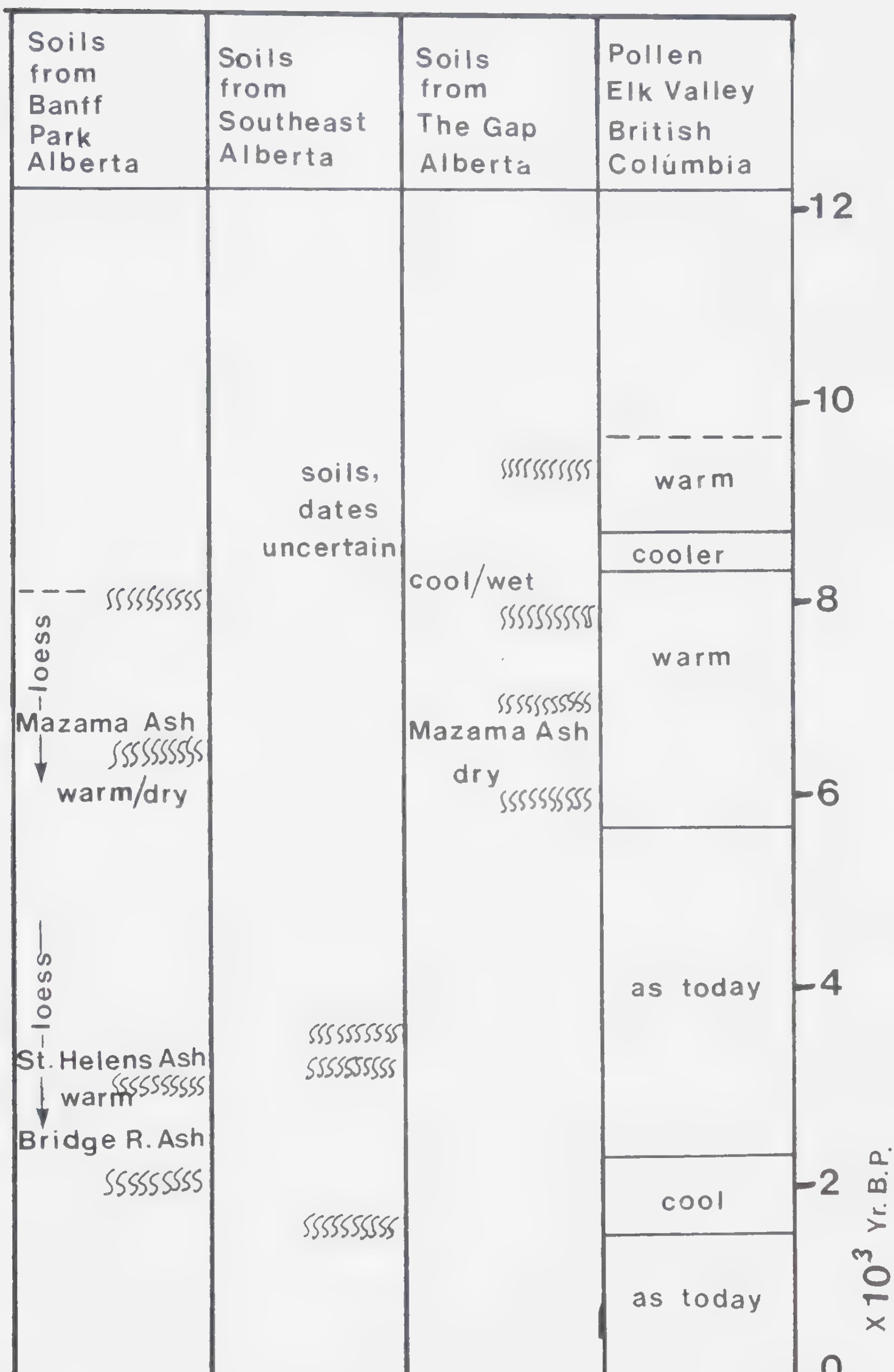
Although not perfected, a more profitable approach may be to utilize small mammal data for local habitat constructions by using the simple coexistence of individual species as a basis for correlation compared with modern mammals and modern habitats. Recent studies on small mammals in Banff–Jasper Parks (Holroyd 1982) show that good correlations exist between certain small mammals in their preferred habitats. Local habitats can thereby be inferred from the coexistence of certain species. The classifications of these associations were constructed from data derived from systematic snap trapping, call counts, track counts, and spot observations at Jasper and Banff Parks; the data collected is the best available (Butler 1983, per. comm.). Only the most important species were used from the correlations and these include: Association 1, meadow vole, western jumping mouse, masked shrew, dusky shrew; Association 2, Gapper's redbacked vole, masked shrew, dusky shrew, varying hare; Association 3, deer mouse, Gapper's red–backed vole; Association 4, heather vole, northern bog lemming, long–tailed vole, Richardson's water vole, meadow vole, gapper's red–backed vole; Association 5, Gapper's red–backed vole, heather vole, varying hare, red squirrel; Association 6, Gapper's red–backed vole, northern bog lemming, varying hare, american red squirrel; Association 7, least chipmunk, Gapper's red–backed vole, deer mouse, varying hare, american red squirrel; Association 8, deer mouse, varying hare; Association 9, not available; Association 10, least chipmunk, Gapper s red–backed vole, deer mouse, pika, golden–mantled ground squirrel; Association 11, western jumping mouse, long–tailed vole, masked shrew, dusky shrew; Association 12, least chipmunk, heather vole, dusky shrew; Association 13, no important species. The habitats inferred from the correlations are significant in two areas of the deposit at the Racehorse Shelter between Levels 2 and 7, and at Level 12. The habitats inferred by the small mammal coexistences in these levels are listed in Table 17.

It can be speculated that from the present to the time represented by Level 7, there were no notable changes from the local mosaic environment of today. From level 7 to 12 a possible unknown change occurred. Level 12 again is similar to that of today, and from Level 13 to 17 the situation is unknown.

TABLE 17

Levels	S.M. Association	Habitat Inferrence
4-7 +12	2	moist coniferous forest with an understory of prickly rose, grouseberry, false azalea, mosses or grasses
2-7	3	mesic lodgepole pine forest with grass or grouseberry understory
2-7 +12	4	wet herbaceous meadows mingled with stands of spruce, subalpine fir or larch
2+12	6	lodgepole pine - spruce forests that have small sedge meadows
4-7	7	avalanch paths, stream activities and immature coniferous forests
4-7	8	moraines, screes etc. with grasslands fir forests, and xeric lodgepole pine forests
4-7	10	lower subalpine - scree slopes, boulder piles, and vegetated colluvium
2-4	11	open slopes with seepages, avalanche paths, and near creek channels in lodgepole pine forest and spruce - subalpine fir forest
2-4		Mesic alpine tundra, and at timberline, heath communities are well developed and where rocky outcrops occur frequently

FIGURE 10 - Climatic Sequences (after Wilson 1982)



One could assume that the deposits span most of the Holocene. Other regional scenarios (see Figure 10) of climatic reconstruction for the Holocene based on pollen and soils may not be local enough to be of use; and each reconstruction is different making interpretation problematic. I can speculate that the unknown change between levels 7 and 12 corresponds to the Altithermal warming period. However, as I stated previously, using a disturbed or insufficient sample for interpretation cannot be reliable. Thus I would not assume the Altithermal hypothesis alone would explain the faunal change at the Shelter.

Identified small mammal elements, if measured consistently, may be useful in showing chronoclinal variations through a deposit; and these may be correlated to other environmental studies for confirmation (e.g., see Morlan 1983). However, Graham (1983:11) states that "a chronoclinal change in a small mammal species has not been observed for the Holocene." The identified elements in the Shelter have not been measured for body size changes through time, largly due to the similarity of small mammal skeletal material and the fact that species would be largely inferential.

Perhaps with a large number of controlled radiocarbon dates from various levels in the deposit more definite statements could be made concerning environmental change through time.

VII. CHAPTER IV: THESIS SUMMARY

As stated in the introduction, the preceding chapters of this thesis were aimed at assessing certain archaeological interpretive biases. The biases arise from the use or misuse of biological theories and improperly applied archaeological methodology. The assumption that small mammals may be used to reconstruct past environments and the human responses to these if certain conditions are met in analysis and data interpretation has, to some extent, been validated in the preceding pages. Following is a summary of these conditions:

Applications of macro–theories, such as the Zonal hypothesis outlined in Chapter I, can work better for the archaeologist; but only if used on a macro–level of analysis. Zonation schemes can apply to large scale paleo–environmental studies. However, when these schemes are applied to single sites in particular areas, such as mosaic environmental regions, interpretations fail to account for intra–site diversity. It is more profitable when dealing with specific site data to restrict the interpretation level to a finer classificatory scheme, the Individualistic approach. With this approach, one can view the reconstructed paleo–habitat and the human responses to it with more clarity. Variation, overlap etc. in the lithic and faunal assemblages can be better interpreted. Each specific zooarchaeological site must be considered in the context of its immediate habitat. A thorough examination of the data is needed to extrapolate continuity and/or change over time. All variables must be considered, all problems have to be stated, and all possible interpretations of each data set and their relationships must be presented in order to formulate a theory. If these analyses are not accomplished, the proposed theory will fail.

The sites excavated in the Racehorse Creek drainage posed many interpretive problems. The shortcomings of the accumulated data were many. The majority of these were methodological problems. More importantly, there were only two sites that yielded identifiable zooarchaeolgical remains. Small sample size, limited field work and restricted funding for proper scientific analysis of collected data were major problems. Not enough field data were collected to state definitely that the Racehorse Creek sites, their natural and cultural contexts, represented diverse environmental responses to variable habitats in the drainage. It was apparent that aspects of diversity cannot be approached unless a large body of data is obtained and compared to another large body of data in other

regions.

The taphonomic study of the Racehorse Shelter bone materials showed that the deposit was a mixed assemblage. The mixture was likely caused by predators, raptors, and scavengers who randomly and/or selectively sampled prey species in various minor habitats surrounding the Shelter. In this regard, attempts to use the small mammal remains to infer paleo-ecological changes or continuity were inconclusive. To rectify this situation it is suggested that more specific taphonomic studies and experimentation are needed to comprehend the nature of small mammal deposits. Detailed scrutiny must accompany the analysis of small mammal deposits in archaeological contexts. The natural interaction of each species in particular and changing habitats must be questioned. Modern analogies can be successfully used, but much data in particularly important areas are lacking.

Tabulated MNIs for each species is often a hazardous method of estimating population or habitat changes. Differential accumulation rates of the deposits has to be considered. More experiments need to be conducted to be able to detect such things as scat and pellet material from other small mammal natural deposits. Patterns of bone breakage must be recovered in the field, not in the laboratory, if inferences of human utilization of small mammals are to be substantiated. Human breakage of small mammal bone has to be identified and compared to breakage caused by carnivores, by digestive processes and the like. The nature of the deposit at the Shelter did not allow for the excavated on-site recovery of this kind of patterned information. More experiments are also needed on small mammal remains in the contexts of natural and chemical weathering. The reasons for differential representation of species and their specific elements must be ascertained to make proper interpretation of a bone deposit possible. Lack of radiocarbon dates, natural stratigraphy, sediment analysis, a larger sample of recovered species, and comparable material from other sites in the region hindered the development of conclusions.

Similar problems occurred when interpreting the materials from the Daisy Creek site. The known diversity of local fauna is not represented in the collections. Aspects of natural and chemical weathering prevented accurate species identification of most of the bone. Though a certain amount of diversity existed in the cultural materials, this diversity

could not be correlated to diversity in the surrounding environment. The cultural artifacts did not fit well with the human responses inferred from the ethnographic literature. Artifact functions and activity areas are inferred on a generalized scale; sample size was not large enough to speculate with accuracy about such things as seasonal occupation, exploitation of diverse habitats, and cultural continuity or change through time.

Artifact material types hint that complex interactions with environments and/or other human groups were occurring on a north–south (mainly south) axis, rather than east–west trans–mountain affiliations. In the study area, man – environment relationships through time will not be known until better evidence is accumulated. Good stratified, well–dated sites are needed. Perhaps then, we could begin to build substantial models and construct cultural variations through time along altitudinal and/or latitudinal gradients.

Understanding the relationship of taphonomy, archaeology, and paleo–ecology is a fairly new field of research. Many hypotheses remain to be formulated and tested. The improper use of modern analogy and the limitations of untestable working hypotheses can jeopardize the inferences made about small mammals and their inferred influences for reconstructing and interpreting the relationships of man and environment in the past. Hopefully, with ongoing research and experimentation, combined with careful interpretation of better field data, and the constructive use of modern environmental studies, the complex problems of relating prehistoric people with past environments will be elucidated.

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IX. APPENDIX 1 : VEGETATION AT RACEHORSE PASS

(Groundsel) Senecio sp.

(Yellow Columbine) Aquilegia flavescens

(Eschscholtz's Buttercup) Ranunclus eschscholtzii

Smelowskia calycina (very rare)

Erigeron sp.

(Yellow Mt. Avens) Dryas drummondii

Epilobium anagallidifolium

(Jacob's Ladder) Polemonium pulcherrimum

(Alpine Forget-me-not) Myosotis alpestris

(Pink Everlasting) Antennaria rosea

(Felwort) Gentiana arctophila

(Leather-leaved Saxifrage) Leptarrhena pyrolifolia

(Engleman Spruce) Picea engelmanni

(Limber Pine) Pinus flexilis

(Mosses)

(Fescue) Festuca sp.

Trisetum spicatum

(Tall Larkspur) Delphinium glaucum

(Alpine Speedwell) Veronica alpina

(White Pasque) Pulsatilla occidentalis

(Valerian) Valeriana sitchensis

(Scorpion Weed) Phacelia sericea

(Yellow Locoweed) Oxtropis spicata

(Cinquefoil) Potentilla diversifolia

(Wild Strawberry) Fragaria glauca

(Sticky-purple Cranesbill) Geranium viscosissimum

(Drummond' Anemone) Anemone drummondii

(Glacier Lily) Erythronium grandiflorum

(Chickweed) Stellaria longipes

(Creeping Juniper) Juniperus horizontalis

(Yarrow) Achillea nigrescens

(Thistle)

(Mushrooms)

VEGETATION AT RACEHORSE ROCKSHELTER

(Mosses)

(Willow)

(Englelmann Spruce) Picea glauca

(Lodgepole Pine) Pinus contorta

(Aspen) Populus tremuloides

(Rocky Mountain Juniper) Juniperus scopulorum

(Shrubby Cinquefoil) Potentilla fruticosa

(Thistle)

(Reedgrass) Calamagrostis sp.

(Fuscue) Festuca sp.

(Wild Strawberry) Fragaria glauca

(Baneberry) Actaea arguta

(Sticky Current) Ribes visosissimum

(Bracted Honeysuckle) Lonicera involucrata

(Wild Raspberry) Rubus parviflorus

(Grouse Berry) Vaccinium scoparium

(Kinninkinnik) Arctostaphylos rubra

(Buffalo Berry) Shepherdia canadensis

(Smooth Gooseberry) Ribes oxyacanthoides

(Saskatoon Berry) Amelanchier alnifolia

(Horsetail) Equisetum sp.

(Heart-leaved Arnicas) Arnica cordifolia

(Mitrewort) Mitella nudia

(Fireweed) Epilobium angustifolium

(American Milkvetch) Astragalus frigidus

(Smooth Aster) Aster laevis

(Twin Flowers) Linnaea borealis

(Milfoil) Achillea nigrescens

(Twisted Stalk) Streptopus amplexifolius

(Meadow Rue) Thalictrum occidentale

(Alum Root) Heuchera ovalifolia

(Common Saxifrage) Saxifraga sp.

(Bracted Wintergreen) Pyrola bracteata

(Wild Rose) Rosa woodsii

(Wooly Everlasting) Antennaria lanata (Prickly Rose) Rosa acicularis

(White Meadowsweet) Spiraca sp.

Hedysarum mackenzie

(Sticky-purple Cransbill) Geranium viscosissimum

(Northern Bed Straw) Galium boreale

(Alpine Milkvetch) Astragalus alpinus

(One-sided Wintergreen) Pyrola secunda

(Common Harebell) Campanula rotundifolia

(Showy Aster) Aster conspicuous

(Wild Sweet Pea) Sathyrus ochroleucus

(Northern Gentian) Gentiana sp.

(Paintbrush) Castilleja miniata

(Rocky Mountain Goldenrod) Solidago multiradiata

(Nodding Onion) Alliumcernuum sp.

Anemone sp.

(Prairie Crocus) Pulsatilla ludoviciana

The plants in the above list were identified using the following reference sources: Looman and Best (1979); Porsild (1974); Kuijt (1982); Garman (1973); and Hubbard (1969).

X. APPENDIX 2 : ARTIFACT DESCRIPTIONS

Plate 1 – Figure a
Artifact #DlPo 4 – 1498
Corner Notched Projectile Point Base
Max. shoulder width = .935cm
Neck width = .785cm
Stem width = 1.155cm
Max. length = .840cm
Notch length = .275cm
Tang length = .345cm
Hafting length = .375cm
Max. thickness = .205cm

The artifact is composed of fine grained white chert. It has low refraction and the texture is smooth. The type of flaking is regular random pressure. The base is horizontally irregular and gently arched. The blades are completely missing. In lenticular cross section it is almost airfoil in shape. There are step fractures at the base in an effort to thin it by percussion. The workmanship is fair. The tangs are symmetrical and tend to flare outward. Pressure formed the notches and some of the base. The shoulders are symmetrical and appear to be pointed angles. The notches are fairly near the base plane and angle diagnally downward from the sides.

Plate 1 Figure b
Artifact #DlPo 4 – 1513
Projectile Point Midsection
Center body width = .985cm
Max. length = 1.055cm
Blade length = 1.565cm (extrapolated)
Max. thickness = .245cm

It is composed of a fine grained black/grey chert from the Top of the World quarry. The texture is smooth and shiny with low refraction. The flaking is regular pressure. The blade form is asymmetrically excurvate. The tip was probably rounded acute. The cross section is lenticular to thin lensed with a raised centre. The workmanship is fair; it is only slightly out of symmetry. The blade edges are sharp and retouched in spots at the proximal end.

Plate 1 Figure c
Artifact #DlPo 4 – 304
Projectile Point Midsection
Max. body width = .760cm
Max. length = .777cm
Blade length = 1.175cm (extrapolated)
Max. thickness = .175cm

The material type is a fine grained translucent blue chert from Top of the World quarry. Its texture is smooth and shiny with medium refraction. The type of flaking is regular pressure. The blade form is more of a tapered shallow arc. The tip was probably rounded acruminate. In cross section it is thin lensed with a raised centre slightly out of balance. The workmanship is average. The blade edges are retouched to sharpen the blade.

Plate 1 Figure d
Artifact #DlPo 4 – 691
Corner Notched Projectile Point
Centre body width = 1.045cm
Max. shoulder width = 1.510cm
Neck width = .595cm
Stem width = .615cm
Max. length = 1.935cm
Blade length = 1.555cm
Notch length = .225cm
Tang length = .195cm
Hafting length = .620cm
Max. thickness = .300cm

The material type is brown translucent Knife River Flint–like and fine grained. The texture is smooth but irregular. The type of flaking is random with retouched edges. The is some cortex on the base. It is asymmetrically stemmed with both blade edges modified. The base is a dimpled shallow arc with wide corner notches(almost staight stemmed). The tip is acute. The blade form is straight converging. In cross section it is slightly airfoil – lenticular, one side has a depressed centre. The workmanship is substandard, it was poorly excecuted, the blade is irregular. There is minor thinning on the base. It has an asymmetrical slightly flared stem one side of which is largely corner notched. The shoulders are pointed asymmetrical. The notches angle diagnally upward from the base.

Plate 1 Figure e
Artifact #DlPo 4 – 418
Side Notched Projectile Point
Centre body width = .775cm
Max. shoulder width = .915cm
Neck width = .755cm
Stem width = 1.100cm
Max. width = 1.100cm
Blade length = 1.265cm
Notch length = .300cm
Tang length = .355cm
Hafting length = .715cm
Max. thickness = .245cm

The material type is a fine grained white/blue–grey chert from Top of the World quarry. The texture is smooth, irregular, and shiny. The notches are asymmetrical. The base is irregular horizontal. The blade form is irregular straight converging. The tip is acute. In cross section it is slightly airfoil to slighly thin lensed with a raised centre. The workmanship is poor because the blade is irregular and due to the general lack of symmetry. The base shows some thinning. The tangs and the shoulders are asymmetrical. It may show some basal grinding. The shoulders are rounded with slight acute angles. There is some cortex on one tang.

Plate 1 Figure f
Side Notched Projectile Point
Centre body width = .885cm
Max. shoulder width = 1.075cm
Neck width = .825cm
Stem width = 1.045cm
Max. length = 1.815cm
Blade length = 1.435cm
Notch length = .255cm
Tang length = .235cm
Hafting length = .515cm
Max. thickness = .265cm

The material type is a dark grey chert with grains visable at 10x. The quarry is unknown. The texture is irregular but mostly smooth. The flaking is random. The edges are pressure retouched and shows some step fractures. There is basal thinning. The notches are asymmetrical and flare upwards distally. The base is irregular but mostly horizontally straight. The blade form is almost excurvate but somewhat straight converging. The tip is acute. In cross section it is slightly airfoiled but thin lensed. The workmanship is fair due to the outline and form being regular. Tangs are asymmetrical and shoulders are small pointed angles. The notches angle slightly downward.

Plate 1 Figure g
Artifact #DlPo 4 - 298
Side Notched Projectile Point
(partial body and base)
Centre body width = .995cm
Max. shoulder width = 1.055cm
Neck width = .655cm
Stem width = .900cm (extrapolated)
Max. length = 2.200cm (extrapolated)
Blade length = 1.755cm (extrapolated)
Notch length = .200cm
Tang length = .355cm
Hafting length = .535cm
Max. thickness = .235cm

The material type is translucent, fine grained grey-blue chert, from Top of the World quarry. the texture is smooth and shiny. It contains regular pressure flaking. The base is horizontally straight. The blade form was probably straight parallel and tip probably acute. It is lenticular in cross section. The tangs are horizontal and shoulders angle about 90 degrees The workmanship is good; notches are well positioned and cross section is well balanced.

Plate 1 Figure h
Artifact #DlPo 4 - 305
Unnotched Triangular Projectile Point
Centre body width = 1.235cm
Base width = 1.085cm
Max. length = 2.275cm (extrapolated)
Blade length = 2.275cm (extrapolated
Hafting length = .665cm
Max. thickness = .200cm

The lithic type is a light blue-grey fine grained chert from Top of the World quarry. The texture is irregularly smooth and shiny. It was manufactured by regular pressure flaking. The widest point is below the midpoint but above the bottom 1/4 The base is an asymmetic shallow arc. The blade form is excurvate and the tip was probably rounded acute. In cross section it is almost flat but is more thin lensed. The edges are retouched.

The workmanship is average; sides are asymmetrical in workmanship. There is almost a pointed tang on one corner. There were three or more flakes to thin the base.

Plate 1 Figure i
Unnotched Triangular Projectile Point
Centre body width = 1.065cm
Base width = 1.300cm
Max. length = 2.165cm
Blade length = 2.165cm
Hafting length = 2.165cm
Max. thickness = .345cm

The material type is a medium grained siliceous siltstone, possibly tourmaline chert. It is smooth but dull with no refraction. The grains are visible through a 10x lens. The type of flaking is random pressure. The base is irregular but horizontally straight. It is widest at the bottom 1/4. The blade form is a tarpered shallow arc and the tip is rounded acute. In cross section it is lenticular with a slightly raised centre. There are no tangs. There are slight step fractures on one side of the base and four or more flakes have been incorporated to thin the base as a hafting modification. The blade edges are somewhat irregular and asymmetric. The workmanship is average; flaking rough and very irregular in some areas.

Plate 1 Figure j
Artifact #DIPo 4 – 349
Unnotched Triangular Projectile Point
Centre body width = 1.035cm
Max. base width = 1.200cm
Hafting length = .645cm
Max. thickness = .355cm

The material type is a dark brown mottled chert of the local Etherington variety. It may have been burnt. It has a grainy texture with little refraction. The flaking is random, irregular percussion and pressure. Percussion is evident along one edge in an attempt to thin the blade. This attempt failed in a large step fracture. The blade edges are almost equilateral with the widest point in the bottom 1/4. The base line is a shallow arc. The blade form is a tapered shallow arc and the tip is rounded acute. In cross section it is lenticular with a raised centre. The base exhibits some small step fractures due to thinning attempts for hafting modifications. The workmanship is fair; the entire point is slightly asymmetrical.

Plate 1 Figure k
Artifact #DIPo 4 – 266
Side Notched Projectile Point Base
Neck width = .955cm
Stem width = 1.400cm
Tang length = .435cm
Hafting length = .900cm
Max. thickness = .345cm

The material type is a white – blue – red mottled chert which was probably burnt. It appears to be a local variety of Livingstone type. The texture is coarse, grainy with no refraction. There is some cortex on one base edge. It was flaked by irregular pressure and percussion. The base line is irregularly rounded. In cross section it is asymmetrical convex. Base edges flare slightly upward. Notches were probably close to the corners. The workmanship is poor with many step fractures evident.

Plate 1 Figure l
Artifact #DlPo 4 - 827
Unnotched Triangular Projectile Point
Centre body width = 1.155cm
Max. base width = 1.415cm
Max. length - blade length = 1.690cm
Max. thickness = .285cm

The lithic type is a fine grained yellow Montana chert. It contains some patination. The texture is smooth and irregular with no evident refraction. The type of flaking is random edge pressure retouch. The blade form is slightly tapered to straight converging. The tip is acute and contains a slight impact fracture. In cross section it is an asymmetrical, almost twisted ( ) thin lens. The flaking is fair; the blade edges and cross section are irregular.

Plate 1 Figure m
Artifact #DlPo 4 - 1358
Side Notched Projectile Point Midsection
Centre body width = .925cm
Max. shoulder width = 1.085cm
Max. length = .975 cm
Max. thickness = .275cm
Blade length = 1.925cm (extrapolated)

The lithic type is a fine grained translucent grey - blue chert from Top of the World quarry. It is smooth and shiny with a fair amount of refraction. The flaking is random pressure. The blade form was probably a tapered shallow arc. In cross section it is airfoil. The workmanship is fair; there are thick sections and a general lack of symmetry.

Plate 1 Figure n
Artifact #DlPo 4 - 866
Unnotched Triangular Projectile Point
Centre body width = .945cm
Max. length - blade length = 1.800cm
Hafting length = .865cm
Max. width = 1.200cm
Max. thickness = .315cm

The lithic type is coarse grained milky white chert of local Etherington varieties. The texture is rough and it is very low in refraction. The base is very irregular, unfinished and canted. There are asymmetical thinning scars on the blade. The blade form is irregular excurvate and the tip is rounded acute. In cross section it is asymmetrical airfoil. Only the edges are pressure flaked while the base was formed by percussion. The workmanship is poor; there are many thick sections and uneveness.

Plate 1 Figure O
Artifact #DlPo 4 - 862
Side Notched Projectile Point Body
Centre body width = 1.185cm
Max. shoulder width = 1.375cm
Neck width = .835cm
Blade length - max. length = 1.925cm
Notch length = .400cm (extrapolated)
Max. thickness = .245cm

The lithic type is mottled red/grey Montana chert. The texture is smoother on one side than the other. A large basal thinning flake protrudes into body. The flaking is random with edges retouched containing some slight edge step fractures. The blade form is excurvate and the tip is rounded acute. In cross section it is almost trapezoidal. The shoulders are straight above and scooped under. The workmanship is fair; the flaking and cross section are irregular.

Plate 1 Figure p
Artifact #DlPo 4 - 1356
Side Notched Projectile Point

Plate 2 Figure a
Artifact #DlPo 4 - 718
Side Notched Projectile Point Base
Max. shoulder width = 1.4cm
Neck width = 1.040cm
Stem width = 1.555cm
Max. length = 1.245cm
Notch length = .220cm
Tang length = .500cm
Hafting length = .885cm
Max. thickness = .255cm

The material type is a medium grained blue-grey chert from Top of the World Quarry. It has an irregular smooth to rough texture with medium refraction. The pressure flaking is random and some percussion is evident on the base. The tip appears to have been removed by impact fracture and it is broken asymmetrically above the notches. The notches are shallow and are also asymmetrical. The base line is very irregular and is canted. The cross section is irregular lenticular. The shoulders are asymmetrically rounded arcs. One tang is horizontal while the other flares downward. One notch is parallel to the base plane while the other angles upward from the base. The workmanship is poor to substandard; it contains many step fractures and is very irregularly flaked.

Plate 2 Figure b
Artifact #DlPo 4 - 118
Corner Notched Projectile Point Base
Max. shoulder width = 1.800cm
Neck width = 1.355cm
Stem width = 1.535cm
Max. length = 1.425cm
Notch length = .685cm
Tang length = .555cm
Hafting length = 1.100cm
Max. thickness = .425cm

The lithic type is a grainy dark grey-blue coarse grained chert from Top of the World quarry. The texture is rough with practically no refraction. The flaking is irregular pressure with some percussion along the base. The tip is missing due to an impact fracture separating it above the shoulders of the point. The base is fairly horizontal but slightly irregular and one tip of the base contains a small nipple. In cross section it appears almost rectangular but distorted The tangs are asymmetrical, one flares outward and the other is irregular. The base shows some evidence of grinding or abrading perhaps in preparation for hafting. The shoulder is a rounded arc and the notches angle diagnally downward from the side. The workmanship is poor and probably reflects an inferior piece of lithic material.

Plate 2 Figure c
Artifact #DlPo 61 - 1
Unnotched Triangular Projectile Point
Plate 2 Figure d
Artifact #DlPo 4 - 545
Triangular Projectile Point Tip
Max. body width = 1.265cm
Max. (blade) length = 2.195cm
Max. thickness = .525cm

The material type is a brown-yellow mottled chert from a Montana quarry. The texture is irregularly smooth with medium refraction. The blade form is asymmetrical, one side is excurvate and the other is straight and fairly irregular. The tip is almost squared probably from impact. In cross section it is thick convex and almost airfoiled. The workmanship is poor; very irregularly pressure flaked.

Plate 2 Figure e
Artifact #DlPo 9 - 9
Unnotched Projectile Point Tip
Max. body width = 1.195cm
Central body width = 1.100cm
Max. (blade) length = 3.015cm
Max. thickness = .390cm

The lithic type is a yellow-red mottled Montana chert. The texture is smooth with low to medium refraction. One side almost contains irregular collateral flaking and the other is regular pressure flaked. It is slighly constricted near the base which is broken away. The blade form is tapered into a shallow arc. The tip is rounded acute and is sharp as are the edges of the blade. It is almost airfoil in cross section but is lenticular with one side containing a raised centre. The workmanship is good; it is only slighly out of symmetry.

>&HEAD('Plate 2 Figure f')>
Artifact #DkPp -
Side Notched Projectile Point
Centre body width = 1.365cm
Max. shoulder width = 1.630cm
Neck width = 1.055cm
Stem width = 1.190cm
Max. length = 2.405cm
Blade length = 1.880cm
Notch length = .285cm
Tang length = .275cm
Hafting length = .550cm
Max. thickness = .450cm

The type of stone from which this point is made is either siltstone or granular chert. It had been burnt and is dark and light mottled gray, discoloured from fire. The texture is coarse and irregular and is dull with no refraction. The quarry source is unknown.The base is a gentle arc. The blade form is straight converging, slightly excurvate, culminating in a tip which was probably acute or acuminate. In cross section it is lenticular with a lightly raised centre. The flaking is irregular. It was edge retouched with many step fractures occurring in attempts to thin the point. Pressure formed the notches and there is moderate basal thinning; a pot lid from fire, erradicated much of one side of the base. The tip was probably broken from impact, the scar is barely acertainable. The tang flares slightly upward, however, it is more horizontal. The shoulders are symmetrical and rounded. The notches are regularly spaced near the bottom 1/4 of the blade and are fairly parallel to the base plane The workmanship is fair; slightly irregular in manufacture.

Plate 2 Figure g
Artifact #DlPo 4 - 497
Corner Notched Projectile Point
Shoulder width = 2.500cm
Neck width = 1.865cm
Stem width = 2.065cm
Max. length = 2.035cm
Blade length = 1.715cm
Notch length = .635cm
Tang length = .325cm
Hafting length = 1.175cm
Max. thickness = .445cm

The lithic type is a fine grained mottled brown-yellow chert from Montana. It is low in refraction, smooth with a dull luster. It is primarily pressure flaked with massive retouching on the blade edges. The pressure flaking is random. The base is slightly rounded and heavily retouched. The base edge is slightly ground and dull. The blade form is asymmetrical due to retouching. The tip is rounded at a broad angle and is slightly impact fractured. The cross section is basically thick lenticular. The tangs are asymmetrical and both flare outwards. The shoulders are also asymmetrical and one is rounded while the other is a pointed angle. The workmanship is fair; it was probably originally very well made but retouching obscured much of the original work.

Plate 2 Figure h
Artifact #DlPo 4 - 1511
Triangular Projectile Point Tip
Centre body width = 1.400cm
Max. width = 2.065cm
Max. (blade) length = 2.785cm
Max. thickness = .455cm

NP> The material type is a fine grained blue-grey chert from the Top of the World quarry. The texture is smooth and shiny while the refraction is high. The flaking is random with edge retouch one one side only but on both faces of that edge. The blade form is straight converging but the tip is broad, rounded acute. In cross section it is lenticular yet thicker on one side. The workmanship is fair; the edges are slightly asymmetrical and the flaking is rough in some areas.

Plate 2 Figure i
Artifact #DlPo 4 -
Stemmed Projectile Point
Plate 2 Figure h
Artifact #DlPo 4 -
Side Notched Projectile Point
Centre body width = 1.535cm
Max. shoulder width = 1.900cm
Neck width = 1.225cm
Stem width = 1.855cm
Max. length = 2.045cm
Blade length = 1.155cm
Notch length = .485cm
Tang length = .510cm
Hafting length = 1.045cm
Max. thickness = .535cm

The material type is a brown-black banded siltstone known as Banff Chert and occurs near quarry sources near Banff, Alberta. It is medium grained (takes 10x to see the grains) and is irregularly smooth. There is no refraction. The irregular flaking is both percussion and pressure. The base is horizontally straight. The blade form is extremely

excurvate due to massive retouching which also rounded the tip into a broad angle. The tip also contains a small impact fracture. The cross section is convex. The tangs are horizontal. The shoulders were probably symmetrical and at a pointed angle however they have both been snapped off perpendicular. One side has a raised portion where attempts to thin the blade had failed and this left a small bulbous ridge at the centre between the notches. The workmanship is good; the outline and general form are regular.

Plate 2 Figure k
Artifact #DkPp 11 - 33
Stemmed Projectile Point
Centre body width = 1.595cm
Max. shoulder width = 1.785cm
Neck width = 1.175cm
Stem width = 1.170cm
Max. length = 4.445cm
Blade length = 3.265cm
Hafting length = 1.225cm
Max. thickness = .515cm

The material type is siltstone and the quarry source is unknown. It is medium grained, irregularly smooth and dull with no refraction. The base is a very shallow arc but irregular. The blade form is irregular straight converging. The flaking appears to be all percussion and random with no retouch. The tip is asymmetrical but rounded acute. The cross section is irregularly lenticular. The shoulders are asymmetrical rounded arches. The neck flares flares slighly towards the tip but it is straight contracting.

Plate 2 Figure l
Artifact #DlPo 9 - 12
Percussion flake
Length = 2.365cm
Width = 2.115cm
Thickness = .255cm

This attempted projectile point blank is made from Kootenay Argillite with quarry sources known from Kootenay Lake. There are some step fractures along the edges.

Plate 2 Figure m
Artifact #DlPo 9 - 10 and 15
Percussion Flake
Length = 2.875cm
Width = 2.410cm
Thickness = .325cm

The material type as Figure l. It contains some attempted retouch along both ventral edges. It is an attempted projectile point blank which failed due to longitudinal snapping.

Plate 2 Figure n
Artifact #DlPo 9 - 14
Percussion Flake
Length = 3.200cm
Width = 2.055cm
Thickness = .355cm

The material type is as Figure l. This projectile point blank attempt contains many massive step fractures in an attempt to thin it. There is some retouch on the ventral proximal end.

Plate 2 Figure o
Artifact #DlPo 9 - 13
Percussion Flake
Length = 3.345cm
Width = 2.165cm
Thickness = .265cm

The material type is the same as Figure l. On this projectile point blank attempt both edges and the base are somewhat retouched The attempt to produce a usable blank was fairly successful.

Plate 2 Figure p
Artifact #DlPo 9 - 11
Corner Notched Projectile Point
Centre body width = 2.065cm
Max. shoulder width = 2.345cm
Neck width = 1.505cm
Stem width = 1.715cm
Max. length = 3.500cm(extrapolated)
Blade length = 2.845cm(extrapolated)
Notch length = .555cm
Tang length = .355cm
Hafting length = .900cm
Max. thickness = .295cm

The lithic type is fine grained green Kootenay Argillite. It is smooth and dull with low refraction. It is a flake projectile point fashioned from a blank as in Figures l - o. The base is slightly rounded. The blade form is asymmetrical, one edge is excurvate while the other is straight. The tip was probably rounded acute. It is thin lensed in cross section with one edge raised slightly airfoil. The flaking is random percussion but the notches and the base contain pressure flaking. The tangs are asymmetrical, one flares slightly upward towards the tip. The shoulders are asymmetrical as well, one is rounded while the other is rounded and scooped under. The workmanship is fair considering the materials tendency to step fracture; every part is asymmetrical.

Plate 3 Figure a
Artifact #DlPo 4 – 717
End Scraper
Length = 2.225cm
Width = 2.575cm
Thickness = .700cm

The lithic material is a light blue-gray fine grained chert from Top of the World quarry. It was initially a unifacial implement however, it has been retouched bifacially. The retouch occurs on all dorsal edges. Some step fractures are apparent along one edge.

Plate 3 Figure b
Artifact #DlPo 4 – 1499
End Scraper Tip Length = 2.000cm
Width = 1.385cm
Thickness = .445cm

The material is composed of a fine grained blue-grey chert from Top of the World quarry. It is unifacially formed. Retouch occurs on all dorsal edges.

Plate 3 Figure c
Artifact #DlPo 61 – 4
End Scraper Tip
Length = 2.200cm
Width = 1.300cm
Thickness = .300cm

The lithic material is a dark blood-red chert probably from Montana quarries. The artifact has been subjcted to heat, a tiny pot lid is evident, however, it may not have been a purposeful heat treatment. It is unifacially formed and all dorsal edges are steeply retouched.

Plate 3 Figure d
Artifact #DkPp 11 – 31
Bifacial Scraper-Graver
Length = 2.270cm
Width = 1.525cm
Thickness = .545cm

The material is composed of crystaline quartz with the closest known quarry of this material occurring near Premier Lake, British Columbia. The artifact is formed bifacially. The tip shows use as a graver. There is also some distal and lateral edge retouch.

Plate 3 Figure e
Artifact #DlPo 4 - 166
Scraper or Knife Fragment
Length = 2.100cm
Width = 2.545cm
Thickness = .835cm

The material is a red-purple chert from the Etherington or Livingstone quarries. The artifact is snapped distally. It is bifacially worked on the left lateral edge.

Plate 3 Figure f
Artifact #DlPo 4 - 583
Biface
Length = 2.275cm
Width = 2.635cm
Thickness = .600cm

The material is of a shiny black chert with a possible quarry located near Waterton. This artifact could be the base of a large spear point however, it is difficult to tell. It was bifacially formed by percussion. The left lateral edge shows some pressure flaking. There is retouch evident along the ventral and dorsal distal edges.

Plate 3 Figure g
Artifact #DlPo 61 - 2
Biface Fragment
Length = 1.900cm
Width = 2.500cm
Thickness = .500cm

The lithic type is a pink-white mottled quartzite from an unknown source. It appears to be only a midsection; there are distal and proximal snapped edges. Both lateral edges show some fine use damage.

Plate 3 Figure h
Artifact #DlPo 4 - 1506
Biface Fragment
Length = 2.065cm
Width = 1.785cm
Thickness = .575cm

The lithic type is a fine grained blue-black chert from Top of the World quarry. It may be the midsection of a projectile point or a knife fragment. It was formed by both percussion and pressure flaking. Both distal and proximal ends are snapped. There is fine retouch and/or use damage on the left lateral edge.

Plate 3 Figure i
Artifact #DkPp 11 – 30
Biface – Projectile Point or Knife
Centre body width = 1.330cm
Max. shoulder width = 1.525cm
Neck width = 1.265cm
Stem width = 1.215cm
Max. length = 3.075cm
Blade length = 2.085cm
Hafting length = 1.135cm
Max. thickness = .505cm

The lithic type is a fine grained blue-gray chert from Top of the World quarry. It is smooth and shiny with medium refraction The base is irregularly straight. The blade form is asymmetrical. The shoulders and blade edges are irregular. The tip is rounded acute and it is airfoil in cross section. The stem is slightly constricted. The left lateral edge shows some use damage and/or fine retouch.

Plate 3 Figure j
Artifact #DlPo 9 – 8
Biface Fragment
Length = 1.975cm
Width = 2.275cm
Thickness = .545cm

The material type is a blood-red mottled chert from the Montana quarries. The artifact may have been an attempt to fashion a projectile point or preform. It is snapped proximally. The lateral edges show slight use damage or fine retouch. There is some cortex on the left dorsal edge and this cortex probably caused the failure and proximal snapping to occur. It is mainly pressure flaked but some percussion is evident near the cortex remnent.

Plate 4 Figure a
Artifact #DlPo 4 - 407
Uniface Fragment
Length = 1.500cm
Width = .620cm
Thickness = .385cm

The material is a fine grained blood-red chert from Montana quarry sources. Both lateral edges have been snapped. The tip is unifacially retouched and heavy use damage is apparent. It may have been hafted and used as a chiseling instrument.

Plate 4 Figure b
Artifact #DlPo 60 - 21
Drill Fragment
Length = 1.065cm
Width = 1.100cm
Thickness = .245cm

The material type is a fine grained blue-gray chert from the Top of the World quarry. It is snapped at one end. The left dorsal edge shows heavy use and step fractures. The right ventral edge contains haeavy use damage and/or retouch.

Plate 4 Figure c
Artifact #DlPo 4 - 540
Drill Tip
Length = .865cm
Width = .715cm
Thickness = .200cm

The material type is a yellow opaque fine grained chert from the Montana quarries. It is snapped proximally. The left lateral edge on the ventral surface shows heavy use damage while the right lateral edge of the dorsal surface shows the same.

Plate 4 Figure d
Artifact #DlPo 4 - 932
Graver
Length = 1.995cm
Width = 1.565cm
Thickness = .545cm

The material type is a blue-gray mottled chert from Top of the World quarry. The artifact is bifacially worked. The tip was purposefully formed probably for use as a graver. The tip shows massive use damage in the form of step fractures and crushing.

Plate 4 Figure e
Artifact #DkPp 11 - 28
Borer
Length = 4.300cm
Width = 2.210cm
Thickness = .740cm

The material type is a coarse grained volcanic andecite of local source. The right lateral dorsal edge of this percussion flake shows heavy use damage while the left ventral edge shows similar damage.

Plate 4 Figure f
Artifact #DlPo 4 - 922
Borer
Length = 3.365cm
Width = 1.945cm
Thickness = .235cm

The material type is a black siltstone of unknown but local origin. The right lateral dorsal edge shows use damage while the left ventral edge shows the same. The right lateral tip edge also displays some apparent use damage.

Plate 4 Figure g
Artifact #DlPo 4 - 582
Drill
Length = 3.355cm
Width = 2.015cm
Thickness = >375

The lithic type is an orange-brown mottled chert similar to the Montana types. The tip is broken. The entire left and right lateral edges are retouched and/or use damaged on both ventral and dorsal surfaces.

Plate 4 Figure h
Artifact #DlPo 4 - 370
Graver/Borer
Length = 1.900cm
Width = 2.325cm
Thickness = .415cm

The lithic type is a fine grained milky white chert known as Avon chert from Saskatchewan. Both the lateral edges are retouched on the dorsal surface only. The tip is 'burinated' on the right edge.

Plate 4 Figure i
Artifact #DkPp 10 - 1
Uniface Knife/Scraper
Length = 5.640cm
Width = 3.940cm
Thickness = 1.830cm

The lithic type is fine grained blue chert from Top of the World quarry. The ventral surface contains a thin layer of cortex. The dorsal surface shows a large bulb of percussion and a concavness of over 2/3 of the flake. The left lateral edge is the thickest point and on this dorsal edge there are a number of 'nibbles' where hinged micro-flakes were removed probably from utilization. As well, some non-random flake scars of .30cm to .35cm in length occur along this edge. The right lateral edge terminates in cortex and is irregular and grainy.

Plate 4 Figure j
Artifact #DlPo 4 - 735
Knife/Scraper Fragment
Length = 2.135cm
Width = 1.835cm
Thickness = .375cm

The material is a fine grained milky white chert from the Avon quarry in Saskatchewan. The left lateral edge has been steeply retouched. There is a pot lid on the ventral surface indicating that it may have been heat treated.

Plate 4 Figure k
Artifact #DlPo 4 - 668
Knife/Scraper
Length = 4.325cm
Width = 4.725cm
Thickness = .800cm

The material type is a fine grained milky white chert known as Avon chert from a quarry in Saskatchewan. There is some cortex on the dorsal survace. The steep angled lateral edge shows some use damage with step fractures and perhaps a high polish.

Plate 4 Figure l
Artifact #DlPo 4 - 620
Knife
Length = 4.250cm
Width = 3.900cm
Thickness = .780cm

The material type is a fine grained blue-gray chert from Top of the World quarry. The artifact is bifacially worked along the left lateral edges. The dorsal edge is very steep while the retouch along the ventral edge is much shallower. There is some use damage apparent along this edge.

Plate 4 Figure m
Artifact #DlPo 4 - 855
Carved Object-Amulet
Length = 5.500cm
Width = 1.000cm
Thickness = .945cm

The material is composed of a fine grained shale probabgly from a local outcrop. It is basically cylindrical howver, it is flat along one side. Along both lateral sides there are many longitudinal scratches. These are parallel lines with some minor deviant scratches cross cutting them. The 'head' is carved into a curcular 'tit' with various circular scratches visable. The longitudinal scratches were incorporated on the object prior to the formation of the 'head.'

Plate 5

All the following artifacts are retouched and/or utilized flakes.

Figure a
Artifact #DlPo 4 – 581
Length = 1.800cm
Width = 1.310cm
Thickness = .245cm

The material type is a brown-yellow Montana chert. The ventral and dorsal edges show use damage.

Figure b
Artifact #DlPo 4 – 371
Length = 1.600cm
Width = 1.200cm
Thickness = .220

The material type is blue-gray Top of the World chert. It is snapped at the distal and proximal ends. Only minute edge damage.

Figure c
Artifact #DlPo 4 – 432
Length = 1.125cm
Width = 1.355cm
Thickness = .220cm

The lithic type is a yellow-brown Montana chert. The lateral dorsal edges are retouched. It is snapped at the distal end. The left dorsal edge may also show use damage.

Figure d
Artifact #DlPo 4 – 62
Length = 1.140cm
Width = 1.835cm
Thickness = .200cm

It is composed of a fine grained brown chert of an unknown sourse. The distal end is snapped. There is some bifacial retouch apparent.

Figure e
Artifact #DlPo 4 - 429
Length = 1.245cm
Width = 1.725cm
Thickness = .220cm

Figure f
Artifact #DlPo 4 - 1375
Length = 2.300cm
Width = 1.300cm
Thickness = .300cm

The material type is a gree-brown chert of an unknown origin. Both lateral dorsal edges show irregular retouch and/or use damage. The tip may have been used for 'piercing.'

Figure g
Artifact #DlPo 4 - 568
Length = 1.425cm
Width = 1.465cm
Thickness = .200cm

The material is a yellow-brown mottled Montana chert. The flake is retouched/heavy use damage along the right dorsal edge. It is snapped at both proximal and distal ends.

Figure h
Artifact #DlPo 4 - 1340
Length = 2.035cm
Width = 2.200cm
Thickness = .565cm

The material is a blue-black gine grained Top of the World chert. Retouch/use damage along the right ventral and left dorsal edges. It is snapped at the distal end. The right dorsal edge has some flakes removed probably in an attempt to thin the artifact.

Figure i
Artifact #DlPo 4 - 537
Length = 2.345cm
Width = 2.345
Thickness = .315

The material is a yellow-brown mottled Montana chert. The left ventral edge is retouched or shows heavy use damage. It is snapped distally.

Figure j
Artifact #DlPo 4 - 124
Length = 2.500cm
Width = 1.800cm
Thickness = .440cm

The material is a yellow-brown mottled Montana chert. Both left and right lateral edges may show use damage. Use damage is also apparent along the distal edge.

Figure k
Artifact #DlPo 4 - 1424
Length = 1.800cm
Width = 1.865cm
Thickness = .465cm

The lithic type is a blue-gray Top of the World chert. The right dorsal edge shows heavy use damage and some retouch. the left ventral edge shows minimal use damage.

Figure l
Artifact #DlPo 4 - 682
Length = 2.415cm
Width = 2.355cm
Thickness = .735cm

The material is a blue-gray Top of the World chert. The right lateral edge shows heavy use damage along both the ventral and the dorsal surfaces.

Figure m
Artifact #DlPo 4 - 610
Length = 2.200cm
Width = .765cm
Thickness = .455cm

The material is an opaque purple-white mottled local Etherington or Livingstone chert. The left ventral edge shows some heavy use damage.

Figure n
Artifact #DlPo 4 - 320
Length = 2.445cm
Width = 2.215cm
Thickness = .715cm

The material type is a brown-black banded siltstone known as Banff chert with a quarry source near Banff. It may have been a core rejuvination flake. The right dorsal edge shows minimal retouch or heavy use damage.

Plate 6

All the following artifacts are utilized and/or retouched flakes.

Figure a
Artifact #DIPo 61 - 3
Length = 2.900cm
Width = 3.200cm
Thickness = .500cm

The material is blue-gray Top of the World chert. All the dorsal edges show heavy use damage.

Figure b
Artifact #DIPo 4 - 1508
Length = 3.165cm
Width = 2.600cm
Thickness = .445cm

The lithic type is a mottled purple-white chert of local Etherington or Livingstone sources. The left dorsal edge contains heavy use damage while the right is retouched and/or use damaged. It is snapped ad the distal end and along the left lateral edge.

Figure c
Artifact #DIPo 4 - 567
Length = 4.055cm
Width = 1.955cm
Thickness = .430cm

The material type is a mottled brown-yellow Montana chert. The left ventral notch is well formed by tiny retouch and/or by use damage.

Figure d
Artifact #DIPo 4 - 1444
Length = 3.800cm
Width = 2.175cm
Thickness = .385cm

The lithic type is a fine grained siltstone from a local but unknown source. It is retouched on the left dorsal lateral edge and shows heavy use damage on the right dorsal lateral edge.

Figure e
Artifact #DlPo 4 – 1357
Length = 4.165cm
Width = 2.000cm
Thickness = .385cm

The material type is a blood-red and yellow mottled Montana chert. The left dorsal edge displays heavy uniform use damage and slight retouch near the bulb of percussion. The distal tip also shows heavy dorsal use damage.

Figure f
Artifact #DlPo 4 – 1006
Length = 3.600cm
Width = 1.985cm
Thickness = .545cm

The material type is a cream white chert of the Avon type from Saskatchewan. The distal tip of this flake shows ventral retouch and use damage on both edges at the point.

Figure g
Artifact #DlPo 4 – 669
Length = 3.900cm
Width = 2.185cm
Thickness = 1.285cm

The lithic type is a grey black siltstone of local origin with an exact source unknown. There is heavy use damage along the right lateral edge.

Figure h
Artifact #DlPo 4 – 751
Length = 3.685cm
Width = 3.235cm
Thickness = .700cm

The material type is a brown-black banded siltstone called Banff chert with a source near Banff. The right ventral edges of this flake display heavy use damage.

Figure i
Artifact #DlPo 4 – 165
Length = 3.055cm
Width = 4.165cm
Thickness = 1.600cm

The material type is a brown-yellow mottled Montana chert. The right distal edge shows heavy use damage. The proximal tip displays scars indicating a striking platform.

The following list of utilized and/or retouched flakes are not given plate or figure designations. They were not photographed due to the redundant nature of their forms and types.

Artifact #DIPo 4 - 372
Length = 1.975cm
Width = 1.945cm
Thickness = .265

This artifact is a dark siltstone flake of probable local origin. It is snapped proximally and contains a series of wavy snaps along its right edge. A pot lid on the dorsal surface may indicate heat treatment. The left dorsal edge shows use damage.

Artifact #DIPo 4 - 916
Length = 1.800cm
Width = 1.635cm
Thickness = .235cm

The material type is siltstone. Cortex is apparent on the dorsal surface. It is snapped proximally. Retouch and step fractures occur on the left ventral and dorsal edge.

Artifact #DIPo 4 - 114
Length = 1.435cm
Width = 1.760cm
, Thickness = .195cm

The material type is a green=grey chert of an unknown source. It is snapped proximally. Both the lateral edges on the ventral and dorsal surfaces show step fractures/use damage and retouch.

Artifact #DIPo 4 - 665
Length = 2.215cm
Width = 1.095cm
Thickness = .185cm

The material type is yellow-brown mottled transparent Montana chert. The left proximal ventral surface shows use damage.

Artifact #DlPo 4 - 946
Length = 1.725cm
Width = 1.655cm
Thickness = .200cm

The lithic type is a dark siltstone of probable local origin. It is snapped distally. The right dorsal edge shows use damage.

Artifact #DlPo 4 - 361
Length = 3.735cm
Width = 2.000cm
Thickness = .755cm

The lithic type is a dark siltstone of probable local origin. The entire dorsal surface is covered with cortex. Both the lateral edges show use damage.

Artifact #DlPo 4 - 1412
Length = 4.275cm
Width = 3.800cm
Thickness = .700cm

The material type is a dark siltstone of probable local origin. There is some cortex on the bulb. The right and left distal tips show use damage.

Artifact #DlPo 4 - 331
Length = 2.185cm
Width = 2.685cm
1 Thickness = .615cm

The material type is a shiny black chert possibly from near Waterton Lakes. There is cortex along the dorsal surface. The right lateral edge shows use damage along the ventral surface.

Artifact #DlPo 4 - 270
Length = 2.800cm
Width = 3.455cm
Thickness = .495cm

The lithic type is local Etherington or Livingstone chert and is mottled purple. There is some cortex on the bulb. The right lateral edge is step fractured from use damage.

Artifact #DlPo 4 - 605
Length = 1.335cm
Width = 2.545cm
Thickness = .760cm

The material type is Etherington or Livingstone chert and is mottled purple in colour. There is some cortex on the bulb. The left lateral concavity and the right convex edge shows use damage.

Artifact # DlPo 4 - 218
Length = 2.585cm
Width = 2.000cm
Thickness = .295cm

The lithic type is a translucent yellow-brown mottled Montana chert. The left and right lateral edges show use damage.

Artifact #DlPo 4 - 535
Length = 2.225cm
Width = 1.700cm
Thickness = .200cm

The material type is a translucent yellow-brown mottled Montana chert. The right dorsal edge shows non-random use damage.

Artifact #DlPo 4 - 696
Length = 2.300cm
Width = 2.795cm
Thickness = .685cm

The lithic type is a brown-grey mottled chert of an unknown origin. The right dorsal proximal edge shows step fractures and edge damage. It is broken distally on right lateral edge.

Artifact #DlPo 4 - 743
Length = 1.865cm
Width = 1.685cm
Thickness = .520cm

The material type is a course grained light purple quartzite of unknown origin. It is snapped at the distal end. The right ventral lateral edge shows abrasive use damage.

Plate 7

The following artifacts are Cores and Core Fragments.

Figure a
Artifact #DIPo 4 − 1260
Length = 2.885cm
Width = 2.085cm
Thickness = .800cm

This artifact is a flake−blade core fragment a remnent of a siltstone cobble. At least 3 or 4 longitudingal flakes were removed from it. The platform is well prepared and slants to the ventral surface of the flake. It is actually a detached flake from a core. There is no cortex.

Figure b
Artifact #DIPo 4 − 1504
Length = 4.400cm
Width = 2.100cm
Thickness = 1.385cm

This artifact is a flake core made from pale gray cherty limestone. The fragment may have been heat treated. It is very blocky and contains one proximal cortex area.

Figure c
Artifact #DIPo 4 − 1510
Length = 4.175cm
Width = 1.195cm
Thickness = 1.195cm

The material type of this Lens Core Fragment is local Etherington. It is gray−white opaque in colour. It is blocky with some cortex adhering to the proximal surface.

Figure d
Artifact #DIPo 60 − 4
Length = 2.900cm
Width = 1.500cm
Thickness = 1.000

The fragment is of a Lens Core of purple−brown opaque Etherington chert. There were many attempts to thin this small piece.

Figure e
Artifact #DlPo 4 - 860
Length = 4.475cm
Width = 6.700cm
Thickness = 2.675cm

This Lens Core is a fragment of a lens of purple mottled Etherington or Livingstone chert. There is some cortex on both distal and proximal surfaces. There were various attempts to retrieve a good flake from the core, however, fracture failures probably led to its being discarded.

Figure f
Artifact #DkPo 22 - 1
Length = 3.500cm
Width = 2.700cm
Thickness = 2.100cm

The material type is a purple mottled chert of the Etherington variety. It is a Lens Core fragment, well expended.

Figure g
Artifact #DkPo 21 - 1
Length = 4.700cm
Width = 5.000cm
Thickness = 2.665cm

The Flake Core is made of a green black fine grained siltstone probably from the Harvey Mountain quarry in Idaho. There is a bit of cortex near the proximal surface.

Figure h
Artifact #DlPo 4 - 859
Length = 5.135cm
Width = 3.900cm
Thickness = 1.685cm

This cobble Flake Core fragment is made of probable local siltstone. It has lots of cortex.

Figure i
Artifact #DlPo 60 - 31
Diameter = 5.200cm
Thickness = 1.400cm

This cobble fragment of siltstone was bifacially worked as a Flake Core. There is lots of cortex on the extrernal surface. The central portion of the core is of an inferior material and probably caused it to be discarded.

Plate 8
Maul Fragment
Diameter = ca. 7cm

The maul fragment is made of a coarse grained pink–white mottled quartzite. The groove is pecked ca. 1.8cm wide and .3cm deep. The fragment was split in two pieces and shows obvious signs of fire cracking. Perhaps it was re–utilized as a hearth stone.

Plate 9
Unifacial Choppers

Figure a
Artifact #DkPp 12 – 1
Length = 13.500cm
Width = 11.000cm
Thickness = 2.500cm

The material type is a volcanic andecite of local origin. It is heavily battered on the ventral and dorsal surface along the distal edge.

Figure b
Artifact #DlPo 60 – 77
Length = 14.000cm
Width = 9.200cm
Thickness = 2.500cm

This uifacial chopper exibits some battering along all its edges. It is made from coarse granitic rock of none local origin.

PLATE 1

a b c

d e f g

h i j k

l m n o p

PLATE 2

a b c

d e f g

h i j k

l m n o p

PLATE 3

a b c

d e

f g h

i j

PLATE 4

a b c d

e f g h

i j k

m

l

PLATE 5

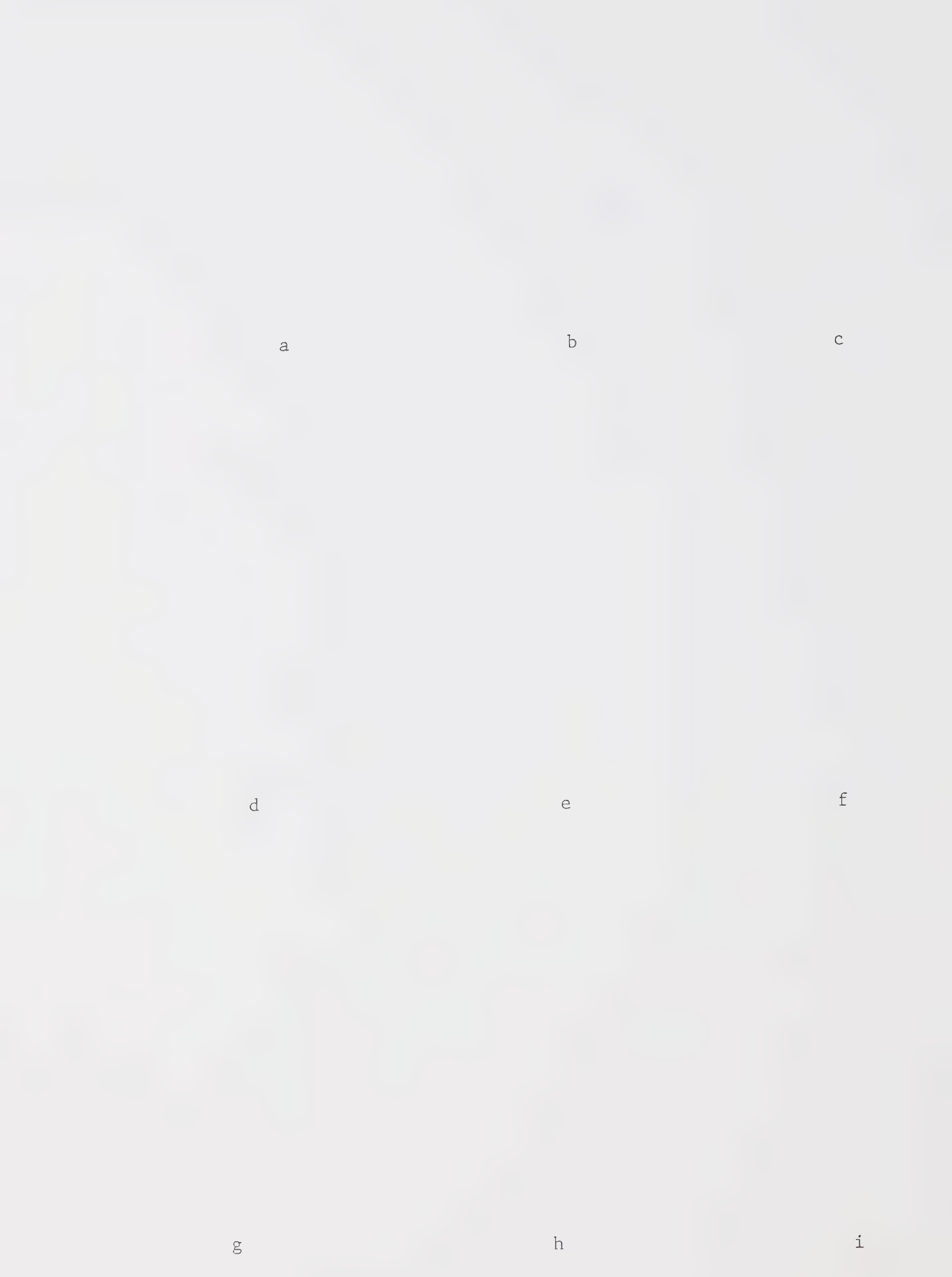
a b c

d e f

g h i j

k l m n

PLATE 6



a b c

d e f

g h i

PLATE 7

a b c d

e f

g h i

PLATE 8

a

PLATE 9

a

b

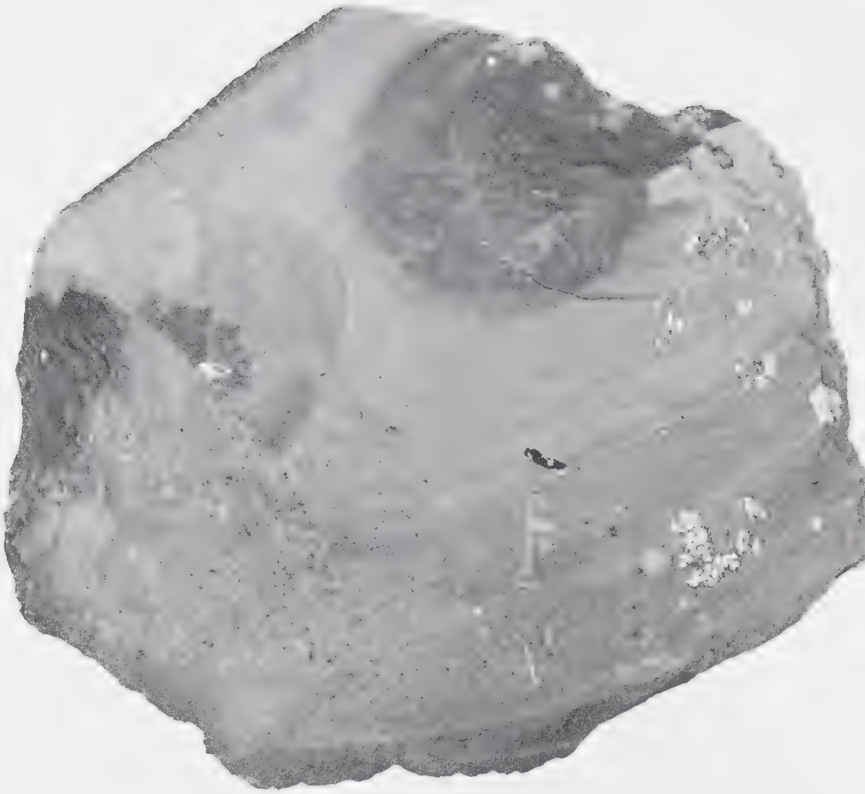


PLATE 10

a

b

c

d